

Classroom Computer News

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MICRONEWS

- Schools now spend three and a half percent of their learning materials budgets for computers and accompanying software, says Harvey J. Brudner, an educational technology consultant. Brudner predicts 400 percent growth over the next five years, bringing computer-related sales to schools to \$300 million, or 14 percent of the total learning materials budget.

- John V. Roach has been elected president and chief operating officer of Tandy Corporation. Roach, who joined the corporation in 1967 after having served as a data processing manager for a consumer finance company, played a key role in developing the TRS-80 microcomputer.

- The Honeywell Foundation, charitable arm of Honeywell, Inc., recently acted on "a commitment to expanded support for higher education" by giving MIT a \$500,000 gift. The money, to be provided over five years beginning in 1981, will support research in advanced computer sciences.

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The Compleat Grantsman

A professional's guide to getting funded

by Anne Gilmer

What? Santa didn't give your school a dozen microcomputers for Christmas? The school budget's as dry as the Mojave? You're thinking that you'd better file that sterling program idea you had away with your dream of freedom from lunchroom duty? Don't despair. There's more than one way to get a micro. Even in these days of fiscal woe, some people are in business to give money away. Foundations, corporations and federal agencies are all potential funding sources for programs that improve education through the use of microcomputers. But how do you find the purseholders? And, even once you've found them, how do you persuade them that your project deserves their confidence and support? To help you answer these questions, CCN has asked a successful, professional fund raiser to share her techniques and advice. We've also prepared a list of publications (see page 7) that might help.

You've developed the classroom computer project of the year. You've submitted the project for approval by the department head, the principal and the superintendent, and they all think it's terrific. Several colleagues at other schools want to try it in their classrooms. But, your principal has given you the word that there just isn't any money for development in the budget.

What do you do now? Like thousands of other frustrated educators, you decide to write a grant. Grantsmanship isn't learned by reading a couple of articles, but you can learn some of the pitfalls and pratfalls, dos and don'ts, and where and how to get started on your quest for money.

Each person who reads or prepares a grant proposal has slightly different expectations as to format, but all expect clear, concise information on which to base a decision. A couple of

Please turn to page 6

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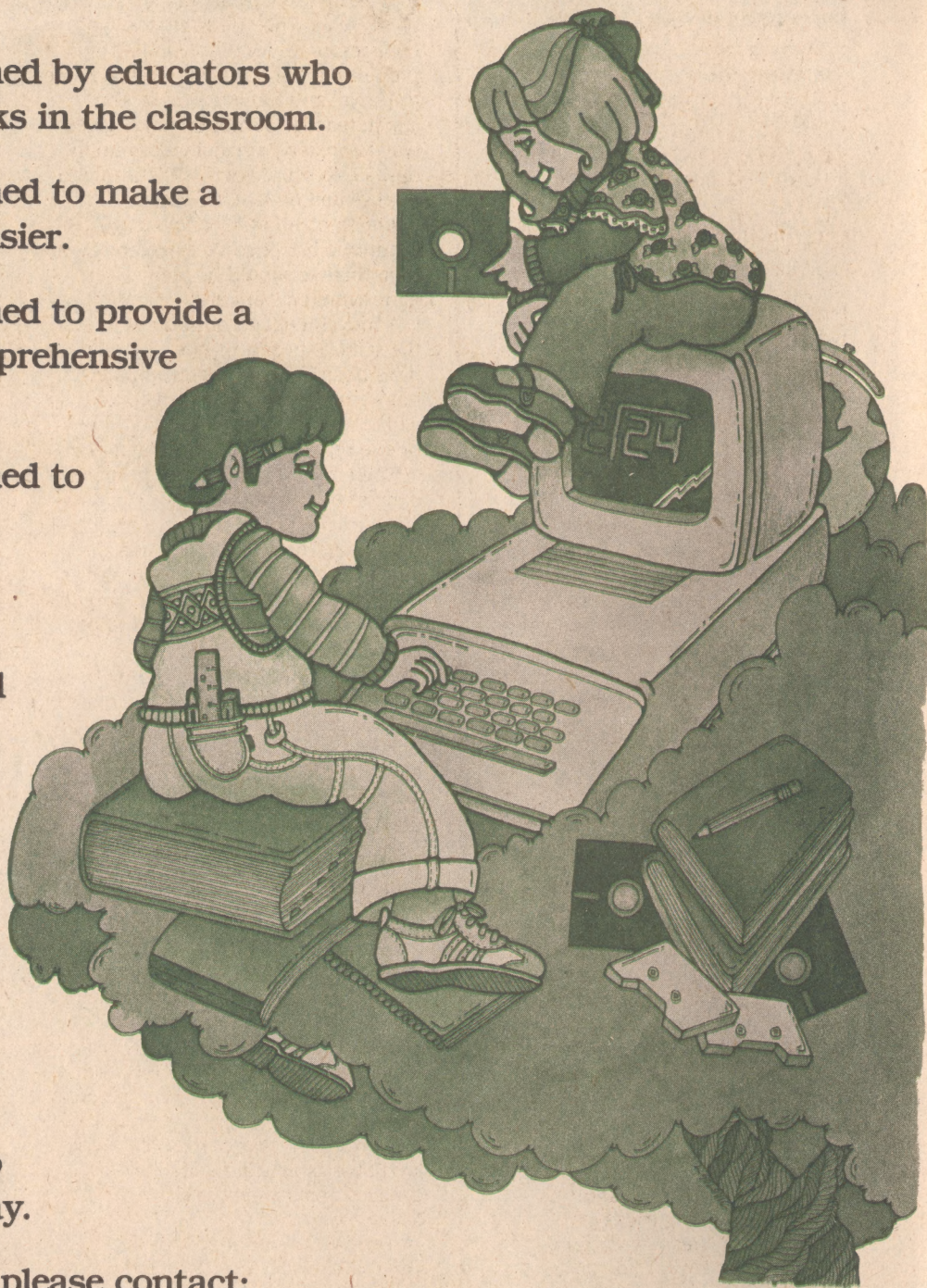
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EDITOR

Lloyd R. Prentice

ASSOCIATE EDITOR

Laurie Beckelman

FEATURES EDITOR

Phyllis Caputo

CONTRIBUTING EDITORS

Jeffrey Katz

Jeffrey Nilson

REGIONAL CONTRIBUTORS

James Dunion (Tennessee);

William D. Hedges (Florida);

Tom Lee (Michigan);

Harry B. Miller (Louisiana);

William J. Wagner (California)

ART DIRECTOR

Mary Rothenbuehler

ASSISTANTS

Ed Hogan

Caron Schwartz

PRODUCTION MANAGER

Jeffrey Katz

PUBLISHER

Lloyd R. Prentice

CIRCULATION MANAGER

Lisa Underkoffler

DIRECTOR OF ADVERTISING

Douglas Wales

OFFICE MANAGER

Laura Koller

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617/787-0240.

FORUM

Promises and Delivery

by Lloyd R. Prentice

We've seen it many times in recent years. Their aims are too high; their resources too limited. Their problems are too big; their rewards are too small and too infrequent. The result: teacher burnout. Energy gives way to anxiety; creativity goes up in despair. Resourcefulness is consumed by resentment; talent by anger, depression and self-recrimination. This syndrome has become sufficiently common that we should be wary when early symptoms appear.

A movement can burn out in much the same way as a teacher. Many of us have been infected with computer euphoria. But have we also come to expect too much too soon and thus opened the door to disappointment?

At the recent conference on microcomputers and education at Harvard University, one caught the faintest whiff of burnout in the air. Gone was the gee-whiz enthusiasm of a year earlier. In its place was healthy, sober appraisal with a taint — near subliminal to be sure — of disillusionment, if not resentment and hostility.

Take the publishers' panel. The publishers were lined up like sitting ducks on the rostrum — Bell & Howell, Ginn, Houghton Mifflin, McGraw Hill, Milliken and SRA. "Microcomputers present many unknowns," they said, "And we're taking big risks in the software area."

"But your textbooks are so bad," was the reply from the educators, "why should we expect your software to be any better?"

Or take the electronic games panel the following day.

"We're in the entertainment business," said a panelist in all innocence.

"Yes, but if your toys result in transference of knowledge," retorted a voice from the rear of the hall, "why aren't we as educators involved in development, testing and dissemination?"

The cues are too feeble to draw definitive conclusions. But under the words we detected the sentiment, "Why haven't you given us what we've been promised?"

We've all heard talk of a revolution in the classroom, of computers

replacing teachers or, indeed, of computers replacing schools. For some the talk is exhilarating, for others it's terrifying. But usually the talk goes far beyond the facts of the matter. The computer is a powerful tool, but it's not a panacea. The danger of over-expectation and enthusiasm is overwhelming disappointment. The computer deserves our enthusiasm, but we must be realistic about its promise.

The computer has application in every area of education, but we are unrealistic if we demand that vendors fulfill our needs before we ourselves define them. We, as educators, must articulate our standards, develop hardware, software and application prototypes, and rationalize our purchasing practices before we can expect vendors, as business people, to begin to serve us. MECC in Minnesota, MicroSIFT in Oregon and the Region IV Education Service Center in Texas have all taken steps in these directions, but so little has been settled that it's still too early to direct our venom toward vendors.

Economically, computing power has been by far the most counter-inflationary product of our decade. It's led us to believe that within a year or two we'll be able to buy mainframe power and natural language capability at drugstore prices. Again, our expectations are unrealistic. While the cost of chips is going down, the cost of hardware and software systems is rising.

Emotionally, the computer promises power. We've seen that up until now computerized control of information has given government, banks, insurance companies and other large businesses enormous power in our society. So we've come to expect that access to cheap and powerful information tools will give us the same. But we must remember that power comes from political advantage and economic scarcity, not through purchase of what is essentially a consumer commodity.

In short, the promise of the computer in education is heady to contemplate, but delivery won't come until we roll up our sleeves, pay our dues and make it happen. If we expect too much too soon, a promising movement in education will burn out well before it's hit its stride.

Publishers Bare Their Problems

The message from the publishers at a recent conference on microcomputers and education at Harvard University is that publishers will provide better software when teachers write it.

"It's a mistake to look at publishers as authors," said Glen Phillips of SRA. "Most print materials come from teachers. But right now, in the area of educational software for microcomputers, there is a remarkable dearth of people stepping forth and saying, 'I can be an author for you.'"

Phillips went on to say that there are many practical hurdles to overcome in producing good software, not least of which is the fact that too few people have both teaching experience and programming skills. While the population of teacher/programmers is growing, the production of quality software is still insufficient to meet the demand.

Dr. Cheryl Weiner of McGraw Hill pointed out that teams are "incredibly important" in software development. She said that McGraw Hill has studied several models for software development — converting lessons contained in existing print materials, giving pro-

grammers free rein to develop innovative materials and having teachers develop models for programs that are turned over to professional programmers.

"They were all disasters," she said. "It's not intuitively obvious how to create good programs." However, the solution may lie, she said, in the direction of development teams that include systems analysts, teachers, programmers and other specialists.

Frank Michael, Jr., of Bell & Howell proposed another approach. His company is betting on the development of authoring languages, computer programs that enable non-technical people to develop sophisticated lessons on the computer. *Genis*, an authoring language marketed by Bell & Howell for the Bell & Howell and Apple computers, is an example of such an approach.

One of the major inhibitors of educational software development is the economics of the education market.

"Less than one percent of the money spent on education in the United States goes for educational materials," said Weiner. "The dog food industry has more money available than do teachers for instructional materials." Computer software will have to displace textbooks, audio-visual

materials, workbooks, ditto masters or other materials if it is to gain a share of the market. And, for now, the potential return on investment is too low for publishers to justify large expenditures for software development. Moreover, recent changes in the tax laws, which make it more expensive to inventory published materials, discourage publishers from trying to meet the needs of small markets.

Despite the problems, many publishers are entering the software market. Bell & Howell, Milliken, Scott-Foresman and SRA are notable leaders. Ginn, Houghton Mifflin, McGraw Hill and Random House, while moving cautiously, are showing strong interest.

Random House Named TRS-80 Distributor

Random House, Inc., a major publisher of classroom materials and books, has become the first Authorized Educational Distributor for Radio Shack TRS-80 computer products for classroom use. Random House will not only distribute Radio Shack TRS-80 products through its educational sales force, but will also produce software for teaching and administra-

tive applications in schools.

This is the first agreement of its kind for Radio Shack, according to Charles A. Phillips, Radio Shack senior vice president of special markets. Phillips called the agreement "an important step in Radio Shack's strategy to better address the growing market for microcomputers and instructional software in the schools."

The Radio Shack/Random House agreement is non-exclusive. Phillips said that at least one other similar agreement with an educational publisher is being negotiated.

TRS-80 Course for Teachers Free

Radio Shack offers TRS-80 buyers a nine-hour computer course for \$29.95. The course comprises both an introduction to computers and an introduction to programming in BASIC. Participants receive hands-on experience with TRS-80s at Radio Shack Computer Stores.

Teachers may take this course free of charge, courtesy of Radio Shack. Contact a local Radio Shack Computer Store for scheduling information and let them know that you are a teacher interested in taking advantage of the teacher scholarships.



Representatives of major textbook publishers interested in educational software shared their views and problems at a recent conference at Harvard University.



Courtesy of Texas Instruments

Texas Instruments' *Speak and . . .* series is among the few computer games that ranks high in educational value.

Computer Toys in the Classroom?

Apart from a few video games, the computer toy industry didn't even exist four years ago. Now it's a billion-dollar phenomenon, grown from a handful of games to hundreds. Many of these are advertised as having "educational" value.

Teachers must deal with this aspect of the computer revolution right now. Their students are acquiring these devices, and parents, in many cases, are looking to the schools to evaluate the educational benefits, or lack thereof.

In British Columbia, researchers from the University of Victoria, on behalf of the Ministry of Education, have investigated the degree to which relatively low-cost electronic games might be aids to learning in a classroom situation. Their results are disappointing.

Few of the 69 devices studied had any direct and useful educational value. Only four were selected as demonstrating "some potential educational value." These were *Dataman*, *Speak and Spell*, manufactured by Texas Instru-

ments, and *Spelling B*, manufactured by Coleco.

For a copy of the complete report, "Low-Cost Microtechnology Learning Aids in the Classroom," contact: Denyse Forman, JEM Research, Discovery Park, University of Victoria, PO Box 1700, Victoria, B.C. V8W 2Y2.

Apple Launches Bonus Computer Literacy Kit for Schools

Apple Computer Inc. has announced a computer literacy program — named Apple Seed — that will provide qualifying elementary and high schools with computer course materials.

Apple Seed will be launched on February 15th in the United States and Canada.

Under the program, Apple Computer will provide a bonus kit of course materials, valued at approximately \$500, to each school that qualifies as a "start-up" school and which buys an Apple computer with disk drive. The offer will run from February 15 to July 31, 1981. School districts expanding ongoing computer education

programs with additional computers can also qualify to receive the free material. The offer is limited to one set of Apple Seed materials per school.

The Apple Seed kit is aimed at serving teachers as well as students. It contains a computer literacy program for teachers and a literacy course for students, including tutorial materials in BASIC for classes with up to 25 students. Also included is the *Educational Software Directory*, the first comprehensive bibliography of software for the Apple computer.

The principal producers of materials for the courses are Science Research Associates, a division of IBM Corporation; Sterling Swift Publishing Company; and Apple Computer Inc.

The Apple Seed material will be sent to schools by Apple computer. Schools that are first-time buyers of 32 kilobyte Apple computers with disk drives qualify for the material, and school districts that have already installed Apple computers in all of their schools can receive a kit if they buy at least one additional 32K Apple with disk drive.

In either case, the computer systems must be purchased from authorized Apple dealers between February 15 and July 31, 1981.

Report Available

The Seeds of Artificial Intelligence: SUMEX-AIM is a new booklet developed by the National Institutes of Health's Division of Research Resources. It describes in detail the evolution of the computer and its eventual successful application to artificial intelligence in biomedical research. The focus is on a community of projects that use the SUMEX-AIM (Stanford University Medical Experiment Computer for Artificial Intelligence in Medicine) network. NIH is offering a single free copy of *The Seeds of Arti-*

cial Intelligence: SUMEX-AIM to anyone who makes a written request to the Office of Science and Health Reports, Division of Research Resources, National Institutes of Health, Bethesda, MD 20205. Bulk distribution will be considered for schools definitely interested in using the publication. Send such requests in writing to the attention of Jerry Gordon, Assistant Information Officer, at the above address.

Software Exchange

One of the first questions teachers who want to use a microcomputer ask is, "What software is available?"

To meet this need, Swen Larsen, dean of science and technology at World University in Puerto Rico, has organized the International Systems and Courseware Exchange (ISCE). Larsen is no newcomer to the computer field. He has served as director of training for Control Data Corporation, as vice president of a computer software firm, as computer consultant to the U.S. secretary of labor and as analyst with the National Security Agency.

According to Larsen, the purpose of ISCE is "to establish a marketplace in which software producers, schools, businesses and professionals such as engineers, doctors and lawyers can sell, or license others to use, their proprietary software for a fee which they establish themselves. We don't own anything. We simply try to put the owner, buyer and seller together."

The first ISCE catalog will be available in February 1981. For more information, contact Swen A. Larsen, Dean, Science and Technology, World University, Barbosa esq. Guayama, Hato Rey, Puerto Rico 00917.

Grants

Cont. from page 1

years ago, I asked one of Jimmy Carter's aides to read a proposal for funding of a major project at the college where I worked. He took one look at it, leaned over the table and asked, "Where's the executive summary?"

"The what?" I countered.

"The executive summary. Everything I read has a summary attached. That's all any busy executive ever reads."

I handed him the printed overview of the project.

Evelyn Wood is *passé*. No one reads past the first two paragraphs of anything unless it provokes interest.

Any proposal you write will have to do that and a lot more if you expect to win the funds. You will write the summary last. What you do to back it up is what counts.

Research First

Your first step will be to write a preliminary proposal. Write as much as you can about what you propose to do, how much it is going to cost, who will benefit and what the end result will be. Put together a basic outline of the who, what, when, where, why and how of your program, together with a budget.

You will then be ready to begin your research. A number of sources of grant money are available to most anyone who is working through a nonprofit institution or school, so designated by the Internal Revenue Service. Private foundations, corporations and government agencies are the principal sources of money. Grants are also available through philanthropically oriented, civic-minded individuals.

Preliminary proposal in hand, you should begin at your nearest large library or at one of the 60 regional collections affiliated with the Foundation Center of New York (they are located in 44 states). College and university libraries also stock some of the key references. Some of the sources you should investigate are the *Foundation Center Source Book Profiles*, the *Taft Systems Reporter* and *The Foundation Directory*. The *Catalog of Federal Domestic Assistance* provides a comprehensive listing of funds available through federal agencies.

All of these references will provide information on the purposes of the various foundations, geographical limitations, size of grants made, guidelines for preparation and submission of proposals. *Foundations Reports*, a bimonthly magazine, provides the most carefully cross-referenced listings of foundation grants. Grants are listed by states in which the foundations are located, subheaded by the foundations. The grants listed are cross-referenced by subject area and by institution or

agency receiving the grant.

You will also find references listing corporate foundations offering similar information. Once you have targeted a number of possible sources for foundation or government support, you should also look at corporate listings available through local libraries, chambers of commerce and business associations, to target businesses located in your vicinity that might be interested in your program.

Grant money is sometimes available through corporate public affairs, public relations or advertising budgets, as well as through philanthropic programs; equipment is sometimes contributed through sales offices.

Read the references carefully, making notes. Funding sources are most often willing to fund pilot projects, particularly ones that can be replicated. They

Evelyn Wood is passé. No one reads past the first two paragraphs of a proposal unless it provokes interest and whets curiosity.

also often require information on how the program will be funded after the grant has been expended. They want to know that they've made a good investment, that your project will continue after their funds are gone and, perhaps, that it has spawned others. Government programs, in fact, require that you disseminate the results of your funded project to other educational institutions.

Variations on a Theme

Some sources fund program development; some provide funds for acquisition of equipment — software or hardware. Government programs, you will note, do *not* provide funds expressly for acquiring computer equipment. Their purpose, always, is to fund educationally sound programs; the computer must be an integral part of a project that falls within the agency's area of concern. Each government agency, like each foundation, has a different mandate. Do your homework.

Once you have assembled your list of target foundations and corporations, including names of corporate officers and foundation officials and trustees, you should circulate your list, together with a copy of your preliminary proposal, among your colleagues, school board members and any community leaders to whom you have access. Ask

them to provide you with suggestions on how to approach the foundations, corporations and agencies, as well as on how to strengthen your proposal.

While circulating your list, check the grant-making histories of the corporations and foundations on the list, looking for organizations that have received grants for projects similar to yours. Contact a couple of the organizations and ask for information on their experiences with the funding sources involved. They could provide valuable leads and, perhaps, sample proposals to help you on your way.

This preliminary groundwork will narrow the field of potential funding sources. When you have your final list, check each potential source for information on approaches and timing. In many cases foundations are amenable to letters of inquiry describing the project and follow-up requests for appointments to discuss the development of full proposals to be submitted to the foundation boards. In any case, foundations are almost uniformly opposed to unannounced drop-ins.

Timing Important

Timing is important in a number of aspects of the process. You will note from your research that the turnaround time from submission of a proposal to notification on action taken can be anywhere from six weeks to six months (or even longer in the case of government programs). Circulating your lists, writing your proposal and assembling the supporting information also takes time. Even photocopying and typing take time — allow yourself enough.

Proposals for funding should be submitted to only one place at a time and should be tailored to the requirements of that funding source. Remember that every foundation, corporation or agency you approach will differ not only in interests, but also in degree of familiarity with your specialty area and in formatting requirements for proposals. These differences should surface during your preliminary research and should guide your writing.

Adult education centers and university extension courses offer brief courses in proposal writing, as do professional services such as the Grantsmanship Training Center programs. A little time spent in a grants workshop is worthwhile. Publications are also available. They range from books of tips to complete courses.

When you finally sit down to write your proposal, you should keep a few basics in mind. Keep it simple. Be realistic about your goals and timing. Use technical language (explaining it) where appropriate, but refrain from using jargon. Make sure that the final product is neat, clean, well-formatted

and grammatically correct. This may all seem very elementary, but in the rush for the funds, people often forget the basics.

Basics Outlined

The categories of information you will need to cover in your proposal are basically the following:

1. Statement of Purpose: What is the educational problem you seek to overcome and how do you intend to approach it? You should include documentation of the need for the program, demographics of the population served and expected outcomes.

2. Project Description: How will you carry out your intent? What methods will you use and why have you chosen them? What are your objectives? What is the time-table? This information should be as specific and concrete as possible.

3. Project Evaluation: How will you determine whether you've met your objectives? Remember, funders are looking for profitable investments.

4. Budget: Your budget should be prepared in cooperation with the fiscal officer of your school.

5. Biography: What is your organization and who will administer the grant? In a manner of speaking, a foundation is hiring you to do a job (albeit, a job of your own creation). They need to be convinced of your credentials before they'll hire you.

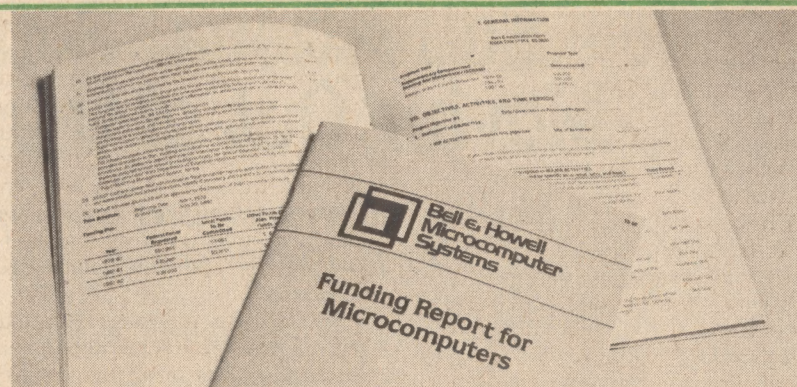
Budgets and credentials of the grant administrator or project director are often included as support material. So are proof of IRS status, letters of support and cooperation from other schools or consultants and sign-offs from the institutional officers.

Learn From Others

Try to get as many tips as possible from others who have been through the process, for the rule of thumb is that the third time around, you will probably be successful (especially in the case of government programs). You must be persistent and adaptable. If you are turned down, find out why.

If you do get the grant, be sure to acknowledge it promptly. Check with the grant making agency about its guidelines on publicity, and have your public relations office issue press releases if appropriate. Make sure that anyone who has helped you in the process is notified of the outcome, whether or not you get the grant. Send them progress reports on your program. And above all, report to the funding agency at regular intervals. Let them know that they've made a worthwhile investment in education.

Anne Gilmer is assistant director for public affairs and development at the Massachusetts Eye and Ear Infirmary, Boston, Massachusetts.



Publications for the Grant-Seeking Educator

Several publications directed at educators who want to obtain grants for microcomputer-based projects are available from hardware manufacturers and associations. Most deal primarily with government funding, covering as many as 44 agencies through which funds are available. As Ms. Gilmer points out in her article (*The Compleat Grantsman*, pg. 1), no government agency has funds earmarked expressly for microcomputer projects. However, if microcomputer-based instruction or administration is a valid method for reaching a specific educational goal that the agency shares, you might just get the funds. The following publications might help you on your way to a computer-filled future.

Apple Computer Educator's

Information Booklet: As part of its educational marketing effort, Apple produces an overview guide to using computers in the classroom that includes a section on government funding. The section is essentially a list of titles and acts through which funds are available. For a copy of the free brochure, contact the Education Marketing Division, Apple Computer Inc., 10260 Bandle Drive, Cupertino, CA 95014; 408/996-1010.

Apple Education Foundation

Brochure: The Apple Education Foundation, established in 1979, gives grants of equipment to "organizations and individuals for projects aimed at creating innovative methods of learning through low cost computers." According to a spokesperson, the foundation is "nondenominational," meaning that it gives grants of PETs, TRS-80s and other microcomputers, as well as of Apples. The foundation's brochure offers an overview of the foundation's purpose, a step-by-step guide to submitting proposals and a list of grant recipients. For a free copy, contact Apple Education Foundation, 20863 Stevens Creek Blvd., Building B-2, Suite

A1, Cupertino, CA 95014; 408/255-3295.

Funding Report for Microcomputers:

Bell & Howell publishes a 44-page comprehensive handbook to assist educational institutions in identifying sources of financial support. The publication includes abstracts of 19 federal programs, including listings of the agency responsible for administering the funds, program objectives, uses for which the funds can be expended, qualifications, proposal deadlines, total funds available, size of average award and contacts. The listings are based on 1979 information, however, making some of the information, such as contacts and amount of funds available, out of date. The publication also includes chapters on proposal writing and on working with state education departments to obtain funding. Free copies are available through your Bell & Howell dealer or from Bell & Howell Audio-Visual Products Division, 7100 N. McCormick Road, Chicago, IL 60645.

The AV Connection: The Guide to Federal Funds for Audio-Visual Programs:

The National Audio-Visual Association (NAVA) puts out this annually updated guide that includes detailed information on federal programs through which funds for purchasing audiovisual materials, equipment and services are available. The most recent volume details 44 federal programs, ranging from Indian education to vocational education to Title I and National Science Foundation programs. It also includes a section on proposal writing. The \$29.95 charge includes *The AV Connection* plus a subscription to *NAVA: Actionfacts*, a funding newsletter published five times a year that updates *The AV Connection*. To avoid paying a \$2 postage and handling charge, prepay your order. The publication is available from NAVA, 3150 Spring Street, Fairfax, VA 22031; 703/273-7200.

Educational Software: Moving Out of the Cottage

*Increased competition and user sophistication are
putting small producers under the gun*

by Jeffrey Katz

The educational software race is on. And while large textbook publishers shoulder each other for position at the starting gate, smaller, more agile vendors have thundered around the first post with materials ranging from math and music to sex education.

Whether from a dining room table or a suite of offices, these small manufacturers produce 90 percent of the many hundreds of microcomputer programs available today. These producers range in size from the programming enthusiast turning out two or three simple programs a year to the educator/publisher with expertise in a particular subject area producing 20, to companies with full-time programming staffs producing more than 50 programs a year. While some companies such as Microphys, Software Factory and Cook's Computer Company produce primarily educational software, others more noted for business and entertainment programs (Instant Software or Muse Software, for example) have begun to offer some educational products as well.

With the field so wide open, everyone is grabbing a horse, whether or not he knows how to ride. The result is that truly valuable products are running side by side with products of inconsistent quality and dubious educational value. Robert Purser, editor of *Purser's Software Directory*, once suggested that 95 percent of microcomputer programs should never have been written, a sentiment echoed in the computer-using educator's lament, "but where are the quality programs?"

Missing Constraints

Until recently, neither the consumers nor the competition had produced the kinds of marketplace constraints that would force higher quality production. The entrepreneurs and educators who started the educational software industry were pioneering an open and ill-defined market, servicing users who knew relatively little about computers, their potential and how best to use them in education. Over the past year, however, the level of user sophistication has grown dramatically. Says one university professor who has taught a course in educational microcomputing

for the past three years, "Two years ago students were entering my course with great naivete and apprehension about the computer. The students coming in now know what the computer is and what it can do and are saying 'give me the tools I need to put it to work in my school.'"

Furthermore, publications and organizations that evaluate educational software are springing up, providing educators with hitherto unavailable information on which to base their purchasing decisions. *Purser's Software Directory* and *School Microware* are publications offering software reviews. Groups of educators using computers, such as Project LOCAL in Massachusetts, Computer-Using Educators (CUE) in California and the Minnesota Educational Computing Consortium, feature software evaluation from the teachers' point of view. Some of these organizations also sell programs and provide software exchanges. Agreed-upon standards for educational software do not yet exist, but organizations such as these and the Technical Educational Resource Center in Cambridge, Massachusetts, and the Northwest Regional Educational Laboratory in Portland, Oregon (see p. 14), are developing evaluative models, bibliographies of reference materials and software lists.

Increased Competition

As important an influence as growing user sophistication will be increasing competition. Like hardware producers before them, basement and back-room software writers have paved the way for the guys from the 19th floor. Small vendors have tested and developed a market that is now attracting businesses with greater financial and staff resources. Large publishers and other companies that become involved in the educational software market will not necessarily replace small vendors, but they will force a redefinition of product and role.

The major educational publishers enter the educational software market with the following advantages: their larger staff and financial resources position them to do more exhaustive research, development, evaluation and

field testing of programs; these resources also enable them to take on larger projects, of the scale of a basal reader, for example; they have considerable experience with curriculum development and can call in experts from any field; they have preexisting text materials that they can either convert into software or tie-in to software through workbooks and teachers' manuals; they have sophisticated market research capabilities at their command, and they have sales distribution networks in place and funds for slick packaging and professional promotion and advertising — in many cases they have their own in-house advertising departments.

"With limited resources for development, marketing and distribution," says John Victor of Program Design Inc. (PDI), a small vendor specializing in language arts-related programs for the TRS-80, "we can't compete on the level of the textbook publisher." So many small vendors aim to provide supplementary classroom materials, rather than the curriculum package approach of the larger publishing houses.

Finding Their Niche

Nevertheless, the "small-is-beautiful" maxim holds some truth for the educational software industry. While many large publishers are complaining about the difficulty of producing good software, the small vendors are actively peddling programs — some good, some bad and some indifferent. With smaller overhead and shorter turnaround time, small vendors can afford to cater to specialized markets and needs while the large publishers, on the other hand, must stick to the mainstream. The California-based vendor Edutek, for example, produces its programs on a contractual basis for individual schools, producing programs to meet specific teachers' needs; Micro Learningware, another small firm, offers a German language package along with its mainline math, science and language arts programs. Still other vendors, such as PDI and Microphys, have chosen to specialize in programs for specific subject areas, specific

grades and specific machines. As the large publishers come out with their comprehensive curriculum packages, the small vendors are likely to find their niches becoming even more specialized.

The lower overhead and faster turnaround time small vendors have also enable them to keep their prices down. Programs from small vendors are available for as little as \$7.95, as compared with the hundreds of dollars for a package from a major publisher. In reality, however, the two products simply can't be compared. The less expensive product usually won't include such important support materials as a teachers' manual or adequate user documentation. Moreover, a major publisher cannot afford to risk its reputation by putting out an unreliable product — a disk or tape that won't load into the computer, for example, a complaint that purchasers of software from small vendors have had all too often. And, further, major publishers are in a better position to back up products with updates, revisions and replacement of damaged media, whereas there are many marginal businesses among the small vendors so there is always a risk of nobody around tomorrow to service a product sold with good intentions today. On the other hand, the lower-priced product may be perfectly adequate for a given situation — particularly when the vendor has a known good reputation, the budget is tight and the user has adequate technical knowledge to deal with problems if they arise. Some small vendors also sell higher ticket items, with the accompanying documentation.

Heat's On

As a result of growing user sophistication and competition in the marketplace, the heat is on the small vendors to confront issues of technical quality, educational suitability, marketing strategy and customer service. One thing is certain, if they don't field-test their products before they market, the field will test for them, and even slick marketing won't help them. As one marketing man put it, "The best way to kill a bad product is good advertising."

The small, educational software vendors are hardly an homogenous lot. The degree to which they currently involve educators in designing their products and to which they field test programs vary considerably, as does the quality of their output. Even Robert Purser's harsh denunciation of 95 percent of all programs leaves five percent successful. Most of the firms contacted for this article say that they do bring educators and programmers together to develop their products. PDI's staff, for example, includes a reading specialist; the four authors of Cook's Computer's

Please turn to page 24

A Small-Vendor Sampler

Cook's Computer Co.

1905 Bailey Dr.
Marshalltown, IA 50185

Cook's features a variety of math and word games written by educators and school-tested, and a 14 program educator's disk (\$19.95), all for the Apple. Programs are appropriate for grades 4-12. PILOT, a teacher authoring program with a manual is also available (disk and 32K Applesoft).

Creative Computing Software

PO Box 789M
Morristown, NJ 07960
800/631-8112

"The number 1 software and applications magazine" produces several simulation programs for TRS-80, Apple and Atari on disk or cassette, including ecology, economics, social studies areas. All come with study guides and are suitable for jr./sr. high school.

Edu-Ware

22222 Sherman Way Suite 102
Canoga Park, CA 91303
213/546-6783

Edu-Ware focuses on the development of instructional materials for the Apple. Most materials are tutorial teaching systems. Programs offered include elementary math for primary grades and remedial learners, Compu-Spell for grades four through eight and Edu-Pack, a diskette with four reading programs suitable for grade five to adult. Prices range from \$9.95 to \$49.95.

MicroGnome

5843 Montgomery Rd.
Elkridge, MD 21227
301/796-4165

MicroGnome offers CAIware which mixes text, graphics and multiple-choice/fill-in questions. These programs allow teachers without programming experience to create software using their own curriculum. Packages offered range from \$42.95 to \$125.00; all are for the TRS-80.

Micro Learningware

PO Box 2134
N. Mankato, MN 56001
507/387-1649

Micro Learningware offers programs for the TRS-80 II for grades 5-12. Programs include: math, spelling, history, science, German language, business and geology. Versions for the PET 8K are also available. All programs are \$24.95.

Microphys Programs

2048 Ford St.
Brooklyn, NY 11229
212/646-0140

Microphys offers CAI and individualized instruction-type programs in high school chemistry, physics and math, junior high math, vocabulary and spelling for the PET. All diskettes are \$20.00.

Minnesota Educational Computing Consortium

MECC Publications
2520 Broadway Dr.
St. Paul, MN 55113
612/376-1118

A computer using educators group offering a semi-annually updated catalog of materials for the Apple II. Subjects include: Math, language arts, social studies and science for elementary grades and middle school, science and social studies for high school, and special programming guides. Diskettes are \$15. Supporting booklets and reference materials are also available, \$.25-\$10.

Program Design Inc. (PDI)

11 Idar Court
Greenwich, CT 06830
203/661-8799

A variety of language arts-related programs including: Vocabulary, spelling, IQ builders and analogies for TRS-80. \$13.50-39.95. Pre-school-adult.

Project LOCAL

500 Nahaton St.
Westwood, MA 02090

A group of computer using educators is making these home-grown, school-tested programs available. For the TRS-80. Programs include: Biology, business, ecology, social studies. All suitable for jr./sr. high school. \$8.95-\$17.95.

Software Factory

515 Park St.
Anoka, MN 55303

Software Factory offers two large packages for the TRS-80 II. Basic math skill games (12 programs) \$89.95 and 8K math work problems (6 programs) \$54.95. Both for second grade level. Also offered are 4K versions of the above and: 4K spelling demons with spoken word; 4K U-Spell which creates spoken spelling lessons. \$34.95-\$54.95.

Starry, Starry Night

Creating Constellations Using Apple II Graphics

by Jim Palmer

Polaris, the North Star, is 680 light-years away, but you can bring it as close as your Apple II microcomputer. With the extensive graphics capabilities of the Apple II, you can easily plot stars and constellations on your television screen or monitor. Decide which constellation you would like your students to study (perhaps someone's zodiac sign), chart it on graph paper and enter the "stars" into your microcomputer.

Plotting a Constellation

How about trying Orion the Hunter, the famous and exceedingly brilliant winter constellation? All you need is some graph paper, a book of constellations (*Stars*, one of the Golden Guide series, by Herbert S. Zim and Robert H. Baker, is inexpensive and has good constellation drawings), a pencil and some understanding of the Apple coordinate system, and you're ready to begin.

Standard graph paper, while adequate, will produce a distorted screen image. The Apple II coordinates are "squashed" vertically to accommodate the four lines of text displayed at the bottom of the monitor. Therefore, for more exact star pictures, I recommend that you either make your own graph paper on a ditto master or purchase Apple graph paper from your software dealer. Another thing — remember that the coordinates for the Apple grid system run from 0 to 39, not from 0 to 40.

Now, plot some star points. Follow along in your star guide and block-in the points on the graph paper to represent the shape of Orion the Hunter. I generally graph only the major stars in a constellation, the ones that are truly visible in the nighttime sky.

Before entering these points into the computer, choose a suitable background color for the sky. In Apple language, COLOR = 6 will produce a radiant blue sky. To color the stars yellow, try COLOR = 13.

The following program will turn your monitor into a sky theater, painting the screen blue and the

stars of Orion the Hunter a vibrant yellow:

```
10 GR
20 REM SOLID COLOR SCREEN
30 COLOR = 6
40 COLUMN = 0
50 VLIN 0,39 AT COLUMN
60 COLUMN = COLUMN + 1
70 IF COLUMN 40 THEN GOTO 50
80 REM PLOT STARS OF ORION
90 COLOR = 13
100 PLOT 10,5: PLOT 21,3:
    PLOT 19,15: PLOT 17,17:
    PLOT 15,19: PLOT 12,30:
    PLOT 24,25
```

*Turn your monitor
into a sky theater,
painting the screen blue
and the stars
a vibrant yellow.*

To add the name ORION to the screen, graph the name on your grid paper (this facilitates subsequent alterations in style and in letter placement. Instead of just single points, you can now use commands for horizontal and vertical lines (HLIN and VLIN). The next few lines of the program spell Orion's name in the color green:

```
110 REM SPELL ORION
120 COLOR = 12
130 HLIN 20,22 AT 33: HLIN 20,22
    AT 34: HLIN 20,22 AT 37:
    HLIN 20,22 AT 38: VLIN 35,36
    AT 20
140 VLIN 35,36 AT 22: VLIN 35,38
    AT 24: PLOT 25,36:
    VLIN 36,38 AT 27: PLOT 27,34:
    HLIN 29, 31 AT 35
150 HLIN 29,31 AT 38: VLIN 36,37
    AT 29: VLIN 36,37 AT 31:
    HLIN 33, 36 AT 35: VLIN 36,38
    AT 34: VLIN 36,38 AT 36
999 END
```

Notice that I often double-up on the parts of letters that are drawn vertically to make them two blocks wide. I do this because the vertical dimen-

sion of the grid system is slimmer than its horizontal counterpart.

A Parade of Stars

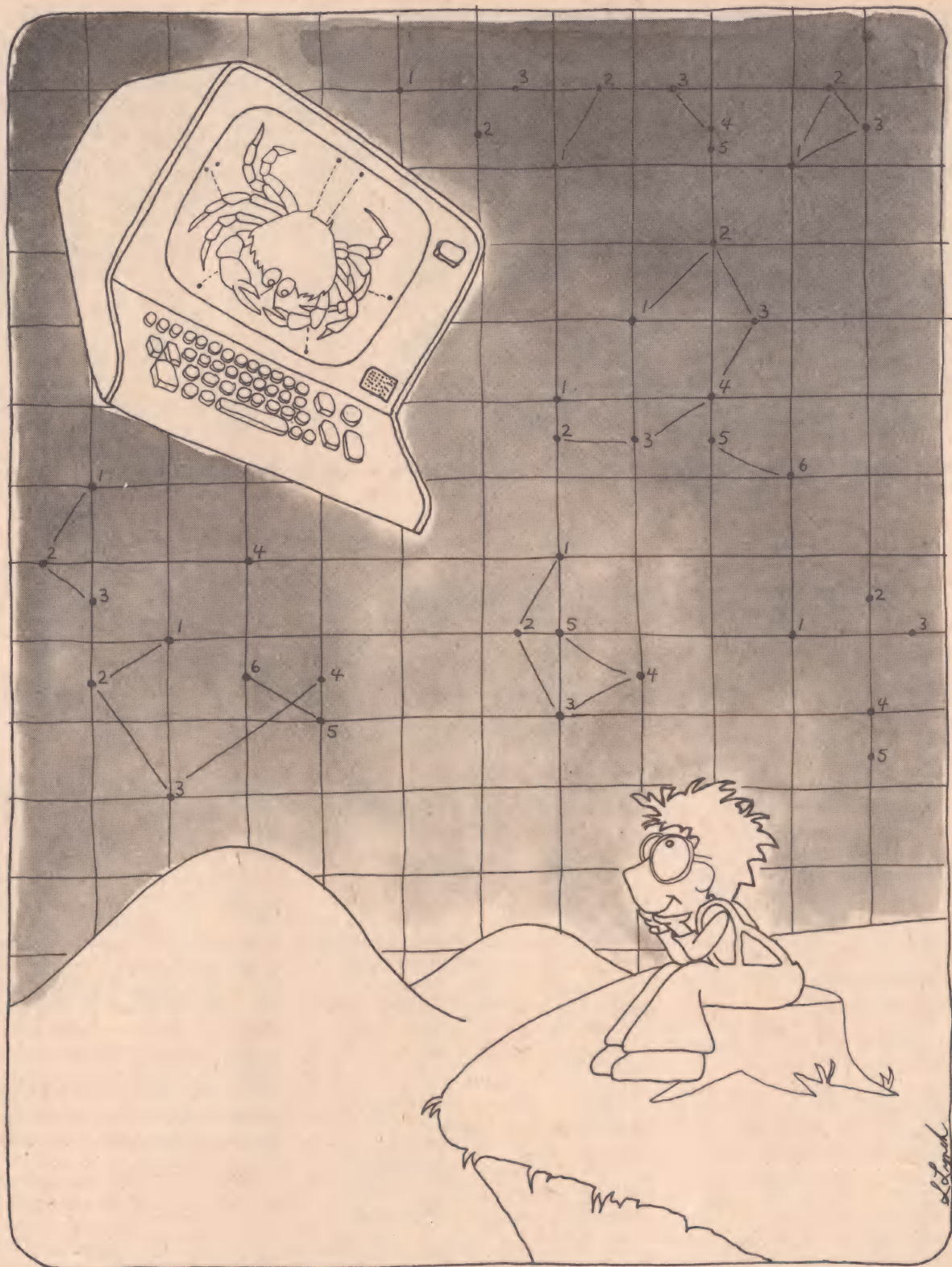
Now that you have the basic idea, group several constellations, perhaps the circumpolar constellations or the 12 zodiac constellations, and string them into a parade-of-the-stars program. You will use some portions of the program such as the routine for choosing the color of the sky, repeatedly. Place these in subroutines, using variables to change the specific color of the sky, the stars and the corresponding name. But don't stop there.

You might plot the more important or exalted star(s) in a designated constellation in a contrasting color, thus distinguishing it from its neighbors. Or use opposing hues to help students visualize different stellar magnitudes or luminosities. With the Apple II's high resolution graphics, you can plot the stars of an entire celestial season simultaneously. In addition, you can draw diagonal lines to connect the stars, thus providing visual closure of a particular constellation. High resolution graphics also allows 90-, 180- and 270-degree rotations of a visual display, enabling you to simulate the progression of stars around the north or south celestial poles. You can also print lines of ascension (celestial longitude) and declination (celestial latitude), and you can enlarge stars, thus making specific magnitudes, luminosities and/or uniquenesses of a star visually dominant.

Name the Constellation

I have compiled a program of 12 constellations which I've used to help both teachers and students identify the array of stars observed in the seasonal heavens. The program has been most successful when used as one component of a field-based study that combines instruction from the teacher, textbooks, the Apple and viewing the nighttime sky.

In the program, the 12 colorful constellations (the Big Dipper, Orion, Cassiopeia, Sagittarius, Pegasus,



Auriga, Bootes, Leo, Hercules, Gemini, Taurus, Scorpius) are assigned numbers from one to 12. The learner enters a number into the computer, thus randomly calling up one of the constellations. The screen turns a solid color, the specific constellation appears in the complementary hue and the program asks the learner to identify the constellation, presenting four possible answers.

If the learner answers incorrectly, the program provides a clue. For

example, if the constellation is Sagittarius, the clue "Milky Way brightest in this part of the zodiac" might appear. If the learner still fails to correctly identify the constellation after three guesses, the correct answer appears on the screen.

I have found that the clues often prompt further research, thus promoting greater familiarity with the constellation. The game as a whole has proved a highly successful learning and motivating tool for both

children and adults who are studying the stars.*

*The *Name the Constellation* program is available from the author. Contact Jim Palmer, 46 E. Main St. Stafford Springs, CT 06076, for price and other information.

Jim Palmer taught middle-school science in Storrs, Conn., and is currently completing his doctorate in the Science Education Program at Boston University.



Omar Castanos

The math program at Francis Lewis High School attracts students from all over the New York borough of Queens, largely because of its computer component.

Francis Lewis High: Method to their Mathness

by Jeff Nilson

At a time when students avoid taking advanced math courses, a high school mathematics program good enough to draw students from all over the New York City borough of Queens is remarkable. And if the Board of Education allowed them to, many junior high graduates would travel to Francis Lewis High School in Flushing from all of New York's five boroughs, just as they travel to the prestigious, competitive, all-city high schools like Bronx Science and Stuyvesant. The word is getting around that if you are an honors junior high student who enjoys math, Francis Lewis is the place.

On the surface, Lewis looks like an average urban high school. The block-long, three story building built of yellow bricks, steel and cinder blocks sits in a neighborhood of single family houses not far from St. John's University. One of the 94 neighborhood high schools in New York City, it offers hundreds of courses from crafts to calculus to 3,000 students from both middle class and poor areas.

A Special Blend

Why then is Lewis's math program so attractive to students? Good teaching and strong support from Principal Melvin Serisky, himself once a math teacher, account for much of the program's success. In addition, according to several eleventh and twelfth graders, learning math at Lewis can be fun. And

it is fun because of the way teachers mix math with computer science. The special ingredients in Lewis's math program are four programming courses: Programming in BASIC, FORTRAN-WATFIV, PL-1, and COBOL and assembly language. "We want students to see the computer as a powerful tool for solving problems in mathematics and science," says Assistant Principal Gerald Elgarten, chairman of the math department. "The computer science courses are 80 percent math from the start."

In the first weeks of school, teachers establish a dialogue between computer science and math. They introduce a problem and enough programming to solve the problem. The math and the programming come in the back door with a minimum of fanfare, dispelling for many students any feelings of math anxiety. (The courses attract students of all levels, not just math wizards.) As a result, students approximate pi, find primes or find the solutions of linear congruences without worrying if they are in over their heads. Their grades are not based on whether they understand these concepts, but on programs they write as projects during the semester. In this way, they get the benefit of working through most of the important ideas in high school math.

How does the mixture of math and

programming actually work in class? The BASIC programming class first examines the important ingredients in a computer program: developing a plan of attack and writing the instructions for the computer to solve the problem. Then students spend a couple of weeks learning how to solve the equation for a line, $Ax + B = C$ for x . At one point the teacher points out that the students can't get a computer to unravel an equation if they don't know how to simplify equations themselves. With that caveat, the class reviews the important techniques for solving linear equations. From this work the class develops an algorithm to solve the equation for x .

From the algorithm, the class constructs a plan, and from the plan, they write the BASIC instructions. The teacher fills in the facts about PRINT, INPUT, LET, variables, line numbers as needed. The definitions of BASIC syntax play second fiddle to the problem the computer is supposed to solve. But such an approach to teaching programming may be the most powerful of all in light of a University of Colorado study. Researchers found that students remembered professors' quips and off-hand remarks far longer than their lectures.

Dry Runs

As the final step, the students learn how to "walk through" their programs.

"Unless you have a computer at home," they are told, "you should refine your programs before you run them because you won't have much time with the computer." The students set to dry running their programs: charting the variables, substituting numbers for them and recording what happens to the variables. Finally, they load their clean, efficient programs into the computer.

The rest of the one semester BASIC course follows this pattern: introduce a math problem, devise an algorithm; write a plan to solve the problem, present whatever new BASIC instructions are needed to write a program that will execute the plan on the computer. Working in this way, students in the BASIC class design programs to solve geometry problems including perimeters, areas and intersections of circles. Then they explore aspects of number theory: prime and amicable numbers, modular arithmetic and probability, including a program to imitate a dice game. Finally they investigate transcendental functions, for many students, a full year or two before they take trigonometry. By December, the ninth and tenth graders are writing programs to find the values for the trig functions.

After they finish the course in BASIC, students can take semester courses in FORTRAN-WATFIV, PL-1, and COBOL and assembly language. Many of the math topics covered in the introduction to programming re-emerge in the FORTRAN and PL-1 courses. For these, students rework the algorithms they created for BASIC in the new computer language. Later they write programs to study problems including Euler's five functions, finding E by sequence and exploring standard deviation and properties of logarithms, matrices and determinants.

New Vistas

Learning programming gives students a sense of power over mathematics and science. This leads them to sign up for all kinds of courses they wouldn't have considered taking before. Ninth and tenth graders, who took BASIC to learn how to program war games, end up taking calculus as seniors. Several students choose to enroll in the rigorous International Baccalaureate Program, a course of advanced study which is based in Geneva, Switzerland, but administered through high schools world-wide. If they complete the program successfully, they can obtain advanced placement at over 100 universities including Harvard, Yale and Oxford. Others think more seriously about pursuing careers in mathematics and the sciences.

Unlike many computer science programs that introduce the history and uses of computers before students learn

programming, Elgarten waits until the last course to present these ideas. Students then learn COBOL and Job Control Language to solve business problems. Finally, they investigate assembly language, which gives them an insight into the underpinnings of high-level computer languages. According to Elgarten, this final course convinces many students to major in computer science in college. Many of the students who know programming often earn advanced placement in college computer science programs. Some also pay for a healthy part of their college expenses working as part-time programmers.

About 250 students take computer science courses at Lewis. The students in the BASIC course run their programs on the school's five microcomputers. Because of the \$5,000 in repair costs last year, the math department's PDP-8 has been retired. With the savings, Elgarten hopes to buy some more micros.

The math and the programming come in the back door, dispelling feelings of math anxiety.

For the past several years, the advanced level BASIC students have learned their programming on a Hewlett-Packard HP-9820A, a purposely primitive machine with a small memory that must be programmed one memory cell at a time. Since the machine has only 173 memory cells, the students quickly learn to be careful programmers. When loading a program into this computer, the program starts at one end and the data at the other. Too often the two parts meet in the middle; but the HP-9820A does not compromise. It simply doesn't run the student's program.

Because of the shortage of computer time, students perfect their programming skills primarily through classwork and homework. But that is no great problem, in Elgarten's view; although he would like to have more computers. Elgarten does order a printer with every new small computer he buys. These enable students to take listings of their programs to work on at home. The computer room is organized so that the students work for no more than 20 minutes at a time on a microcomputer. This scheme enables 100 students or more to use the computers each day whenever they have some free time.

Students taking FORTRAN, PL-1 and COBOL key punch their own programs on one of the school's five key punch

machines. Student lab assistants then run the programs on an IBM 370 via a remote terminal in the computer room. The average turn-around time for the programs is 40 minutes.

Programming Challenges

The emphasis on independent, project-oriented computer science at Lewis produces several highly skilled 16 and 17 year old programmers each year. At other schools these students might have little to do, but at Lewis, Elgarten and his staff have provided plenty of programming challenges. The math office serves as a conduit for requests from teachers for programs like the one a student wrote to keep track of student physical fitness scores. Designing and perfecting games also occupy many advanced programmers' time. The computer room is often alive with pops, buzzes and flashing colors as the programmers emulate *Space Invaders* and *Sea Wolf*.

The most notable project in Elgarten's view is a remedial math program advanced students are working on for the Board of Education. For each of 110 elementary and junior high math skills, the Board wants a computer program to reinforce the work remedial students are doing in texts. Each project begins when Elgarten meets with his student programmers to develop an algorithm to generate the problems required to practice a particular skill. Then he sets them to work. He is available if they need him, but he says they seldom do.

The chief programmer on the remedial skills project is senior Chris Welty. As a ninth grader, Chris took the advanced entrance exam for Stuyvesant and got an almost perfect score. But he chose Lewis because of the programming it offered. Now he wants to go to CalTech or Northwestern, but not to MIT because it doesn't have the kind of astrophysics program he wants.

The president of several clubs at Lewis, its best programmer and one of its best students, Welty appreciates the good teaching and freedom he has experienced there. "They let me get into the computer stuff I was interested in, like games," he observes.

Asked what he thinks was the most valuable part of the computer science program at Lewis for him, he says, "Since I did so well, I'm known at the Board of Education. I'm on a one-to-one basis with the math department chairman. I'm known throughout the school. Teachers are always coming up to me and having me do programming for them. I guess that's the most valuable part."

Jeff Nilson is an eighth-grade teacher and a contributing editor to Classroom Computer News.

MicroSIFT: National Network to Evaluate Software

by Phyllis Caputo

A new, educational software clearinghouse intends to "make sure that educational software is as dazzling as the hardware," according to its project developer, Dr. Judy Edwards. Called MicroSIFT, an acronym for Microcomputer Software and Information for Teachers, the clearinghouse is coordinating a nationwide network of educational computing consortia and organizations to help conduct software evaluations. The goal, of course, is to provide teachers with much-needed information on the quality of commercially available software.

MicroSIFT began operation in December 1979, under the auspices of the Northwest Regional Educational Laboratory's Computer Technology Program and with National Institute of Education funding. The 14-year-old

Northwest Regional Educational Laboratory, located in Portland, Oregon, helps organizations improve the quality and equality of education through both research and development programs and direct service.

MicroSIFT will provide some of both. It is presently engaged in research and development, as it works out criteria and procedures for reviewing commercially available software. This will lead to the direct service of publishing software reviews, of establishing standards and guidelines for developing new software, and of developing workshops and training opportunities for teachers, principals, school librarians and other school personnel.

Networking

The concept of networking, of coordinating the efforts of computer-using

educators nationwide, is the core of the MicroSIFT model. Staff envision a four-part software evaluation process in which participating educational groups carry out the essential function of on-site evaluation. The process would work like this:

Software would arrive at the MicroSIFT offices for initial inspection. Using three microcomputers, an Atari 800, an Apple II Plus and a TRS-80, all on loan from vendors, staff would evaluate the software's educational suitability and completeness and would make sure that it runs. A surprising number of programs would be returned without further evaluation. "Documentation of educational software is a severe problem," explains Project Developer Edwards. "Naked software," a software package containing just the disk or cassette with no accompanying directions, won't make the grade. In other cases, programs will be returned for technical deficiencies — they won't load or they get stuck in loops.

If the program passes this first test, MicroSIFT staff will write a description of its instructional purpose, technique, package form, documentation and other salient features. The package will then go on to network sites for evaluation.

At this time, a professional teacher with experience in the program's subject area and grade level reviews the materials, tests the program and assesses its instructional value. Typical concerns might include: Is the learning model accurate? Is it bias free? Is it learner controlled or machine controlled? Is the stated objective achieved?

Network members will also conduct the final, in-depth evaluation. If the package has passed all three preceding stages, the participating educator will assess its instructional effectiveness by testing students' skills both before and after work with the program, and by observing students as they use the software. An expert in the curriculum area the software covers will supervise this evaluation and will make recommendations to MicroSIFT regarding the product.

Field Testing Criteria

Much of this process is already in place, but the goal thus far has been to field test the criteria and the evaluation forms, rather than to produce publishable software reviews. When MicroSIFT began in December 1979, MicroSIFT staff, Northwest Regional Laboratory's Technical Advisory Board and other professionals in the education field met to draw up initial criteria for software evaluation. They developed evaluation forms and testing procedures which incorporated these criteria, and then



Courtesy of MicroSIFT

MicroSIFT's Dr. Judy Edwards
14/CCN

began training teachers in the Portland, Oregon, public schools to use the instruments. They asked teachers to rate each criteria on a scale of one to four and to more generally comment on the adequacy and scope of the proposed evaluative instruments.

With criteria changed to reflect the experience of the Portland teachers, MicroSIFT piloted the review forms again, this time in Beavertown, Oregon. When field testing ended last month, teachers at a total of ten network sites had participated. MicroSIFT

*The concept of networking,
of coordinating the efforts
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MicroSIFT model.*

is still modifying the criteria to accommodate the teachers' recommendations, and therefore won't make the specific criteria public. Staff is also developing an Evaluator's Guide, which will explain how to use the criteria so that software reviews are uniform.

Procuring Software

Establishing procedures for procuring software and for disseminating software reviews is also high on the MicroSIFT agenda. Currently some of the network sites are providing software, MicroSIFT has solicited software from the small, "cottage industry" producers, and some software has come unsolicited. Publishers such as Scott, Foresman have sent in instructional packages, as have hardware providers including Texas Instruments and Radio Shack. A more formal system is not in place.

MicroSIFT staff will be writing the actual software reviews after the software has been evaluated at two network sites. It is considering either publishing the reviews itself and selling them at cost, or publishing and selling them through a commercial publisher. In either case, staff foresee the MicroSIFT network as a prime means of publicizing and disseminating reviews.

However MicroSIFT gets the word out, it's sure to have a significant impact. Even at this early stage, more educational groups have requested membership in the MicroSIFT network than MicroSIFT can accommodate. (Like the criteria, the list of participants is in flux, and therefore not available for publication.) And MicroSIFT sees software evaluation as just the beginning of its activities.

Future Activities

Edwards says that MicroSIFT plans to develop and publish guidelines for future educational software development. The evaluation criteria, she suggests, could become the basis of these guidelines. MicroSIFT has already been conducting preliminary reviews of new educational software for publishers; staff hope, eventually, to help bring software packages up to publishable standards, to conduct publishers' searches for good software and to establish criteria for publisher selection.

MicroSIFT is an important first step toward overcoming the long-standing complaint of low quality educational software. One hopes that MicroSIFT will not only help educators weed out the quality products from the poor ones, but that its guidelines will also assure a higher quality of future software.

And MicroSIFT is also an important first step toward educators taking control of educational computing. As Edwards says, "This clearinghouse is a connection. There were no holdouts among the large educational computing organizations." Network meetings display a real sense of cooperation, she says. Members are exchanging ideas and helping each other to, as one network member put it, "feed-forward!"

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EDU-WARE

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Edu-Ware's primary business is the development of pre-packaged instructional software systems to be employed with the microcomputer. We challenge those who may make similar claims to match these specifications:

- A management team trained in and focused on Instructional Development.
- Programs that pre-test, specify learning objectives, provide practice, reinforce, and test for mastery learning.
- Instructional algorithms which reject incorrect responses while reinforcing those which are indicative of desired learning.
- Screen displays which capture attention and motivate interest by utilizing established principles of perception.
- Program documentation developed for both student understanding and teacher utilization.
- Programs specifically designed to provide for acquisition, learning, maintenance learning and remediation.

IF YOU ARE A TEACHER:

Edu-Ware recognizes your need for instructional materials that can make a most demanding task—teaching—easier and more effective. Our software supports you in this effort because:

- The employment of recognized, state-of-the-art, instructional methodologies maximizes attainment of teaching goals.
- Edu-Ware programs transform your computer into a powerful teaching tool, not a trivial student toy.
- Interaction with Edu-Ware systems develops student self-management of learning.

If you or your school employ an Apple Computer and have an interest in quality C.A.I., please write us for product information . . . or contact Sherwin Steffin at 213-346-6783.

EDU-WARE SERVICES, INC.

22222 Sherman Way, Suite 102, Canoga Park, CA 91303

A Pocket Full of Miracles

Some fanciful reflections on how pocket computers may expand our classrooms

by Jeff Nilson

A slide rule, partially hidden by a set of 78 rpm recordings of the Paul Whiteman Orchestra, does not sell for 50 cents at a yard sale. Who knows how to use one these days? And who wants to go through the trouble? The last group of students to work regularly with slide rules also walked down the beach listening to Murray the K on their transistor radios.

As Bob Dylan got further and further beyond the pivotal age of 30, students began doing their math and science homework with electronic calculators. Even in the back rows of eighth grade classrooms, 13 year olds no longer glance furtively around before slipping their calculators out of their book bags. They are computing electronically without fear.

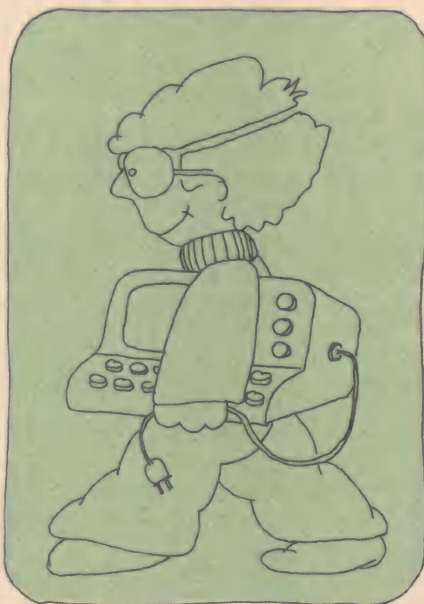
The National Council of Teachers of Mathematics now recommends that calculators be used in math class, and people are getting used to the idea of personal computers in schools, at least for teaching programming. So now what does the electronics industry do? It starts selling computers that fit in peoples' pockets.

At least four pocket computers are now manufactured. Radio Shack produces a seven-inch long, six ounce gem that features a 24-character display screen, English language prompting, BASIC programming and 1.9K of random access memory, all for \$249.95; the Sinclair ZX80, manufactured by Sinclair Research, Ltd., the British firm that brought us miniaturized programmable calculators, is the size of a paperback and weighs about 12 ounces. It hooks into a conventional television and offers such nifty features as automatic error detection, text editing and graphic symbols. The price? Just under \$200.00. And of course, the Japanese are coming. Sharp manufactures two machines, the PC-1210 and the PC-1211, both of which are similar to the pocket TRS-80 in format. They should be available in the U.S. this year.

16/CCN

Five for the Price of One

One might well wonder what learning might be like with students carrying computers around in their pockets or backpacks. An obvious use of pocket computers is to teach programming. The hand-held computers are so inexpensive that a school can get nine or ten for the price of two personal computers, monitors and disk drives. With pocket computers available, a teacher might still present a programming idea and an example, but instead of going over the idea on the blackboard and on worksheets, she can



have groups of students do the example on the computers right at their desks.

As an exercise in learning programming, students carrying pocket computers could act out parts of a computer program. Imagine the possibilities in a gimmick called the "Yellow Subroutine," where each of five groups of students writes a subroutine for figuring a different payroll deduction. The

teacher at the overhead projector plays the machine part of the program.

"Jane Smith: hours, 62; rate of pay, \$4.26 per hr.; Social Security percentage, 13.2; federal tax rate. . ." appears on the screen. Alice's group figures the gross earnings and reports the figure to the teacher, who writes it on a mocked up earnings statement. Next, Bill's group figures the Social Security. Other students play the role of program control commands. They wear signs reading "for I = 1 to 15," "Next I," that tell which subroutine goes next and how many more checks still have to be figured.

On-site Learning

But immediate practice is only part of the story. Portability enables students to study real-life situations, too. Imagine a class of seventh graders fed up with not getting enough to eat at lunch. They can use their portable computers to study how productive their school cafeteria is. They write programs to make sense of the num-



bers they get, such as how many hamburgers are baked in an hour and how many eggs were used in the cakes, building a case for wasted motion.

Imagine a sixth grade class that is studying programming, interest on bank accounts and loans, and ways of getting rich. The class is so fascinated with business that the teacher has no choice but to announce a game of "Wall Street." For the next two weeks, students write programs to handle the transactions involved in the massive stock, bond and real estate deals that will be made the third week. Simultaneously, out of cardboard boxes scavenged from stores, Wall Street's stock exchanges, major banks and real estate firms begin to grow up around the room.

When the game begins, two members of the three-student teams will roll dice and move around the financial district looking for stock, bond, commodity or real estate deals. The third member will run the team's business. Banks will loan money and collect it. The transactions will be done with the class's computer programs for figuring simplified interest, rate of return, projected sales, appreciation, depreciation



and so on. At the end of the week, the team with the most money wins a pizza and a certificate of financial genius.

Trigonometry Treasure Hunts

At a demonstration of some educational software, a couple of teachers, who were probably not math teachers, were overheard saying as they watched a microcomputer draw curves for various trig functions, "Even I could have learned trig if I had had one of those."

With the innovative learning experiences pocket computers open up, their students may have a better crack at learning trig, too. Imagine a yellow gold, mid-October day. The definitions of sines, cosines and tangents are waltzing in 30 16-year-old brains. It is time, not for another blackboard review, but for the annual October treasure hunt. Five secret paths snake through the mysterious woods behind the soccer field. Fourteen two-student teams, each made up of one person who is beginning to understand the trigonometry and one who does not, must compete to find the treasure first. They move along the hidden path from tree to tree, following clues written in angles, sines, cosines and tangents. Using the trig functions in a program they wrote the week before, the stu-

Just as we were getting used to the idea of desktop computers, the industry starts selling computers that fit in peoples' pockets.

dents calculate the distance and the angle of the path to the next tree. The team with the fastest program wins.

Just the Beginning

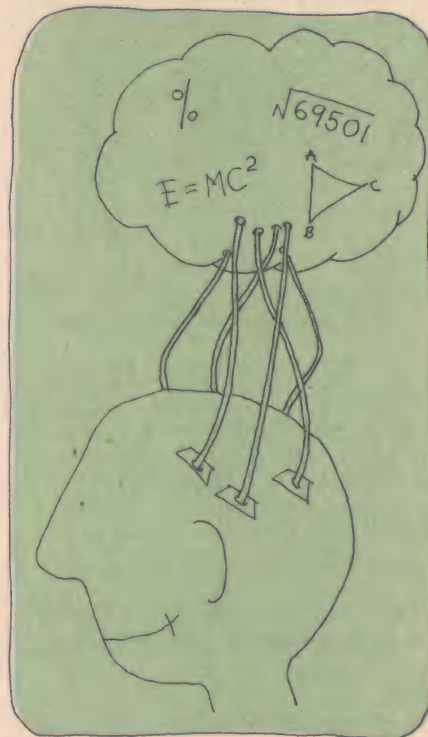
Of course, pocket computers won't be the last word in miniaturization. A group in California is talking about a computer the size of a notebook with a screen that can show pictures with the same resolution as a newspaper photo. And advertisements now claim that when bubble memory is perfected, chips the size of postage stamps will store the contents of a phone book.

Will the ultimate in miniaturized pedagogy be microprocessors implanted in students' brains? We may never — hopefully will never — see that, but many of us may find ourselves teaching students like Lisa.

She is a lean, athletic-looking girl of 17, with long blond hair. She wears an old warm-up suit and running shoes. Her blue eyes are focussed on the screen of an object about the size of a small notebook, which she holds in her left hand. On the maple table beside her are a glass of milk and a plate full of Graham Crackers — without them, she has discovered, she can not study calculus.

Occasionally she presses a few buttons, and the screen changes. It draws a picture, then some equations, then another picture. She is using the notebook-sized computer the school issued her in September. She inserts memory modules the size of hotel bars of soap for each of her subjects. She hardly ever uses textbooks.

With this computer, she studies a calculus topic as if she were directing an expedition. Five views of the concept of finding maxima — written description, simulation, problems, animated problems, tutorials — are hers at the touch of a button. After she selects a



Steve Lynch

topic, she chooses what aspect she wants to look at from a menu on the side of the screen. Touching tutorial and animation gives her a description of a maximum and its definition.

Then the computer presents the classic problem of the farmer and the fence: "Farmer Smith buys 14,000 feet of fencing at a sale. In what rectangular shape should he lay out the fence to surround the maximum amount of field?" She looks at some equations and practices finding the first and second derivative. She has the computer graph the equations for values she enters. Unsure of how area can be maximized, she orders a demonstration of that. She is nearly ready for the problem. She tries some equations and finds the derivatives with the computer checking her accuracy. If she makes a mistake, it branches to a routine that explains the error. Finally, she finds the length and width of the rectangle and enters the values. The computer draws the scene complete with barn and tells her if she is correct.

When she is finished, she stands up and looks at the clock. "12:06," click, "2-16-87."

Midnight already, she says. She finishes the last of her milk and goes off to bed.

Jeff Nilson is an eighth-grade teacher and a contributing editor to Classroom Computer News.

The ZX80: A Beginner's Computer

by Robert F. Tinker and Tim Barclay

One of the newcomers to the micro-computer field is the little English-made Sinclair ZX80, available for \$200. The ZX80 provides the lowest-cost way of giving students a computer system that they can program in BASIC. As such, it is excellent for anyone learning programming.

The reaction to the Sinclair at micro-computer shows and in various computer journals has been enthusiastic. A special ZX80 newsletter, called *SYNTAX*, has already put out its first issue, and the people who publish *Creative Computing* are planning to put out *SYNC*, a magazine devoted solely to uses of and ideas for the Sinclair. Hardware and software developed especially for the ZX80 is already appearing.

Physically, the Sinclair is a very small, light-weight, styled, plastic box about the size of a hardcover book. Its size and shape have been described by some as attractive and non-threatening, by others as insubstantial and plastic. We have noticed that in our resource room filled with microcomputers, inexperienced users tend to gravitate toward the Sinclair, presumably because it is small, curved and friendly looking.

The keyboard is unique. It is simply a flat piece of black plastic that has printed capital letters arranged in approximate keyboard locations and also has lots of other symbols and words. The plastic is pressure sensitive, so pressing fairly hard over the desired symbol enters it into the computer. The style of keyboard is a consequence of the need to keep the price down, but it does have one important advantage

over standard keyboards: it is highly dirt and spill resistant. Of course you cannot type fast on such a keyboard, but it is not clear that that is an important consideration in most applications of this type of computer.

One Touch Keywords

Keywords are a help in entering programs. These are a special feature of the standard Sinclair 4K BASIC which allows the use of one touch entry for most of the common BASIC commands, such as PRINT, LET, INPUT, GOTO, IF, FOR, RUN . . . 26 keywords in all. The manual says this use of a single key to give you a whole word "may save you up to 40 percent of the typing you'd otherwise have to do." In addition to being a help in typing once you get used to them, these keywords are also a way to squeeze more program into the 1K of available memory. The keywords make sense to someone already familiar with BASIC, but for the real beginner they can be an added confusion. If you try to spell out a command like "PRINT" instead of entering it as a keyword, you get a "?" and, to compound your confusion, a syntax error symbol.

In our experience with teachers and administrators at introductory workshops, the manual is not a help to beginners. Called *A Course in BASIC Programming*, it is satisfactory for someone who already knows something about the subject. It seems clear that a better set of introductory instructions and exercises need to be written for use with beginning students.

The Sinclair includes two software aids that assist you in getting your program correct. The first is a syntax-

checking facility that examines the line you are entering. This facility both tells you whether there are any syntax errors in the statement and stops you from entering the statement until the syntax is correct. The other facility is a nice editor that allows you to add and delete characters from any line in your program. Unlike most BASICS, it is not necessary to reenter an entire line that has a small error in it.

TV Needed

The Sinclair makes a complete system with the addition of a standard TV and audio cassette tape recorder. The TV provides the output display for the computer, and the cassette tape recorder is necessary for saving and loading programs if you do not want to enter your program from the keyboard every time you turn on the power. Part of the rationale of the Sinclair sales approach is that people already have a TV and a cassette recorder. This seems valid for the personal home computer market but probably not for schools.

We have had trouble using the ZX80 with small, cheap, black and white televisions; in one case we could get no screen display at all and in another we had such poor resolution that we had trouble reading the display (the 5 and 6, for instance, became indistinguishable). This means you should try out your Sinclair-TV combination before making any purchases. If the TV is reasonably good, however, this should not be a problem.

How might the Sinclair ZX80 be used in the classroom? Naturally, Sinclair made compromises to keep the cost down. We feel that the result of these compromises is a machine best suited for teaching beginning BASIC programming. Teachers ask us, "What do you sacrifice besides memory when you buy a Sinclair?" Actually, this is the same question one should ask when comparing any micro with a more expensive make or when comparing a micro with a larger, non-portable computer, such as a mini or a mainframe. The relevant features are language power, memory space, graphics and speed. New technology has made it possible to pack a lot into a tiny space, but not everything.

One feature sacrificed is the ability to do two things at once, such as enter and display or compute and display. As a result, when you enter RUN, the screen goes blank while the program is executed. This means you cannot watch a table of triangular numbers being generated, for instance, or the building of a bar graph. Another sacrifice is computational power. You cannot make a table of Pythagorean Triples, for instance, because the ZX80 BASIC uses integer arithmetic. This means it is restricted to whole numbers that range from -32768 to +32767. The manual does list a program for taking square

Please turn to page 30



Courtesy of Sinclair Research, Ltd.

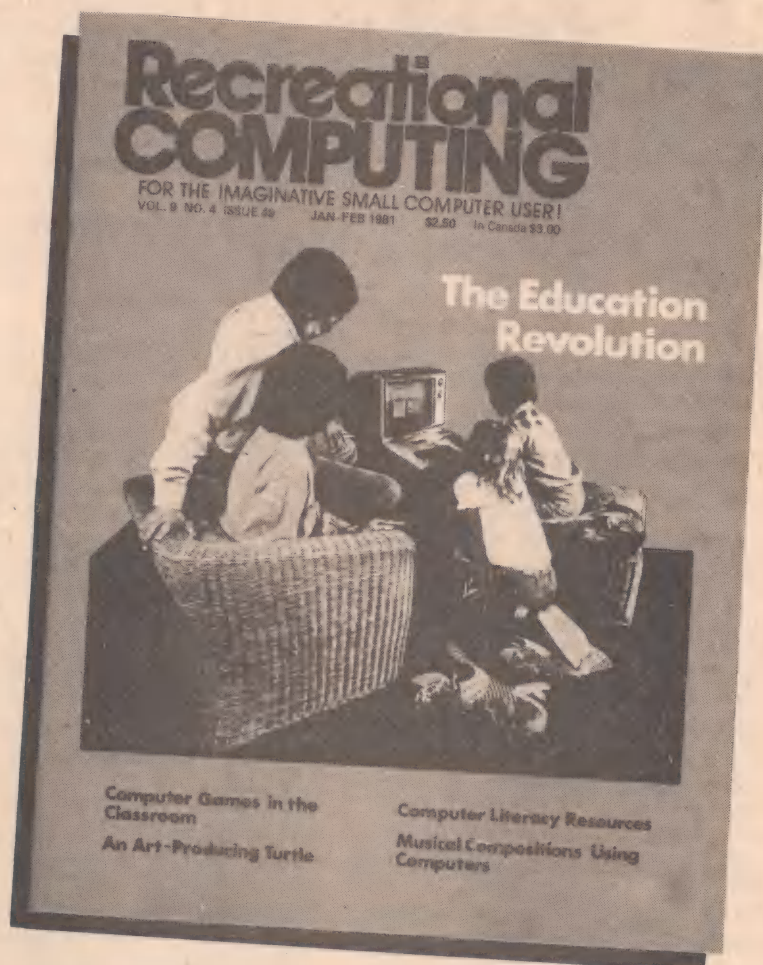
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How Does the Computer Remember? Part II

by Lloyd R. Prentice

In the last installment we noted that when it comes to memory, the computer is little more than an elegant contrivance to replace the old-time practice of tying knots in a string or carving notches in a stick.

The main secret of the computer's success, we pointed out, is the binary numbering system, which provides a powerful scheme for denoting distinctions in the real world that are important to human beings. What makes the binary system so attractive is the availability of small, inexpensive and reliable electrical switches, hundreds of which can fit on the head of a match. These switches, which provide facile physical analogs of the binary digits, can easily be connected into logic circuits that in turn can be connected into whole computer systems.

The heart of the computer is a simple switch, we noted. A turned-off switch provides a fine representation of a 0 in the binary system. A turned-on switch provides an equally fine representation of a 1. At this point, we should stress that the meaning attached to the state of a switch is strictly a matter of definition. A perverse programmer could just as easily reverse the logic and say that "off" corresponds to binary 1 and "on" corresponds to binary 0. The computer could care less. From the computer's point of view, the state of a switch has no meaning beyond the fact that the switch is "on" when electrical current or some other physical event is present in a given electrical circuit at a given time and "off" otherwise. And the state of the switch, in turn, influences the state of other switches connected to it elsewhere in the machine. All of which goes to say that, at this state of the computer's evolution, computers still need human beings to supply the essential ingredient — the significance of all those flippin' switches.

The Central Processor

Before we can go further, it's important to consider how the part of the computer that does the logical work, the central processor, communicates

with memory. (See "When the kids ask. . .", p 17, *Classroom Computer News*, Vol. 1, No. 1). For the moment, think of memory as a long row of post office boxes. Each box can hold one letter or piece of data in binary form. That is, inside each box are eight or more switches that can be turned on or off to represent a given binary number. Each box also has a unique address — another binary number.

Now, think of the central processor as the postman. The postman can either put a letter in a box or, snoopily soul that he is, read the contents of a letter that's been put in a box previously. The only odd thing about this post office is that whenever a new letter is put in a box, the previous contents of the box inexplicably disappear. To run an effective postal service, the postman has to know when to put a letter in and when to sneak a peak at a letter that's already there. He also has

We can think of computer memory as a long row of post office boxes. The central processor is the postman.

to be able to go to the right box, which he can do easily thanks to the efficient addressing scheme.

In a computer, all of this is done electrically. There are three important electrical connections between memory and the central processor. Each of these connections is a set of wires called a bus. There's a data bus, a control bus and an address bus. In a microcomputer like the Apple II or the TRS-80, there are 16 wires in the address bus. Each of these wires corresponds to a binary digit or bit. With a 16-bit address bus, a computer can address up to 65,535 individual memory locations. If the central processor wants to address a particular

memory location, it simply switches the appropriate wires in the address bus to five volts (on) and the others to zero volts (off).

Writing and Reading

Putting the proper memory address on the address bus is only the first step, however. The second step depends upon whether the computer wants to transfer data to memory (write) or retrieve data from memory (read). If it wants to write, it first puts data on the data bus, that is, switches some of the wires in the data bus to the on state and others to the off state. The voltages on the wires correspond to the binary number the processor wants to send to memory. In small computers there are eight wires in the data bus, corresponding to the eight data storage bits (switches) in each memory location. After setting up the address and data, the processor has to signal memory of its intentions to write by switching on certain wires in the control bus. If all goes smoothly, which it usually does, data on the data bus is latched into the proper memory cell as determined by the binary representation on the address bus. All this happens in much less than one beat of a hummingbird's wing.

If the processor wants to read data, it first puts the proper address on the address bus, then puts out a read signal on the control bus. It then waits a smidgen while the memory-addressing circuits hook the data storage switches in the appropriate memory location up to the data bus. It then reads whatever data shows up on the bus.

The important thing in both of these transactions is the addressing — which is performed by an electrical switching circuit which is functionally equivalent to a telephone receptionist who answers a call and switches it to the proper party.

Actually, a computer has more than one kind of memory. So far we have discussed Random Access Memory, or RAM. In the next installment, we'll discuss some other ways that the computer can remember stuff.

The Intelligent Closet

by Richard K. Walton

In the spring of 1979, the staff of the Willard Elementary School in Concord, Massachusetts, began a pilot program using microcomputers in the classroom. We soon realized that we couldn't take the efficient use of our new computers for granted. Deciding where to set up and how to secure our micros presented some unexpected problems. Our original plan was to store the units in the school's walk-in safe and to distribute them from there to the classrooms. But time spent getting the units, unpacking, setting up, breaking down and repacking was considerable. When a teacher did want to use one of the micros, available classroom space and suitable electrical outlets were also problems. These factors tended to discourage computer use.

We found an answer to our dilemma in an existing structure — the classroom closet. The heavy wooden

doors and lock provide a reasonable degree of security. Adjustable shelves on standard side-wall brackets allow us to customize the spaces for the video terminal, the keyboard and the cassette recorder. The one modification we did make was to install two, four-outlet electrical boxes.

Our closet computer center also provides advantages for the students. Microcomputers in the classroom draw a crowd. Interested classmates often surround a student working at a computer set up on a classroom table. This situation distracts the user. The closet location minimizes distractions; students can more easily focus on their work.

The closet computer center provides one solution to the problems of security, access and working space.

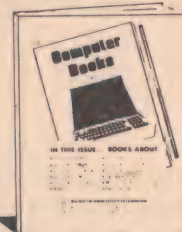
Richard K. Walton teaches fifth grade at the Willard School, Concord, Mass.



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The Computer Dart Board

by Charles F. Cicciarella

The fundamentals of mathematics can be, and frequently are, taught chiefly through repetitive drill and practice. While some teachers pay lip service to the importance of explaining theoretical principles, most clearly emphasize the proper application of rules for the manipulation of numbers; this remains true at all levels of instruction, from elementary school multiplication to college level statistics. Such instruction has value in that it may help students develop the mechanical ability to find correct answers to problems which are similar to those studied. But I doubt that students gain any real insight into the structure of mathematics this way. They may prove unable to solve new types of problems.

Supplemental Instruction Needed

We need a supplement to procedural instruction which will allow the student to interact or "play" with numbers in such a way that he or she begins to gain insight into their nature. To cite an example: we expect a student in a beginning statistics class to learn something about the laws of probability. The procedural instruction dictates that the student learn various rules concerning number of trials, independence and dependence, and so on. The obvious interactive supplement to such instruction is for the student to play with dice, roulette wheels, playing cards and other forms of games of chance.

We can develop activities for the microcomputer that similarly allow students to interact with numbers and so gain insight into various aspects of mathematics. I've developed one such activity — a computer dart game that finds the areas of shapes.

Students from upper elementary grades through college can use the *Computer Dart Board* effectively. The level of understanding will, of course, vary with the age and intelligence of the student. While more intelligent students may independently perceive the mathematical principles that are illustrated, most students need some help from the teacher.

The first part of the program permits the user to create a design using low resolution graphics. The student uses two game paddles, one to move the cursor vertically, the other to move it horizontally. He or she may compose a

design of up to 10 different colors on a white background and may change the colors by pressing game control button #0. This part of the program may be used simply to create colorful designs and, as such, is a multicolor version of Etch-a-Sketch. But as the student draws various geometrical shapes, he or she may become familiar with the properties of these shapes. By using different colors and rearranging the shapes, the student may learn about perspective and about the effects of color on the impact and the apparent size of shapes.

From Design to Dart Board

The student presses the game control button #1 to begin the second part of the program. The design the student created in the first part now becomes a dart board. This part of the program is a useful tool for estimating the area of an irregular shape (its apparent purpose), but is perhaps even more useful

*Students can explore
probability,
measurement error
and estimation . . .
all with a
computer dart board.*

as an illustration of probability and of sample error.

The user selects the number of darts to be thrown. The computer then randomly selects the coordinates each dart will strike and, as it hits, records the color struck. Since all points on the graphics screen have an equal chance of being struck by each dart, the proportion of darts striking each color is an estimate of the area that color occupies. The accuracy of this estimate improves probabilistically as the number of darts increases.

The computer plots each dart in black as the dart hits the target. Then, so that the probability of hitting a given color doesn't change, the computer restores the color of the original design. It records the color each dart strikes and, after all the darts have been thrown, it prints the percentage of darts

striking each color. The dart throwing part of the program includes a return loop for repeating the dart throwing process, thus enabling students to repeatedly measure the area of the design. This opens up the possibility of exploring concepts of measurement error.

Incidentally, I've constructed the program for drawing the design so that the design cannot occupy all of the graphics screen. Since the background color is white, and the percentage of darts striking white is not recorded, the total percentage of darts striking each color is unlikely ever to be 100 percent, although this isn't impossible. Should the user desire to change this property, he or she should change the program line 110, which sets the color of the background, so that the color will be one of those (zero to nine) used in drawing the design.

The program is short — only 60 lines. A number of REM statements serve as landmarks for the programmer. By using the program with an open mind, math or science teachers should find myriad applications. The author would like to hear of any applications CCN readers devise.

Please send any correspondence about the *Computer Dart Board* to: Charles F. Cicciarella, c/o Classroom Computer News, PO Box 266, Cambridge, MA 02138.

Charles F. Cicciarella teaches at the School of Health, Physical Education and Recreation, The University of North Carolina at Greensboro.

The Computer Dart Board Program

LIST

```
10 PRINT "THE AREA OF A SHAPE"
20 PRINT : PRINT "THIS PROGRAM THROWS DARTS AT A DESIGN IN ORDER TO FIND THE AREA OF SHAPE." : PRINT
```



```

30 PRINT "THE PERCENTAGE OF THE
    AREA OF THE SHAPE TO THE TOT
    AL AREA IS ESTIMATED BY THE
    PERCENTAGE OF DARTS HITTI
    NG THE SHAPE."
40 PRINT : PRINT "UP TO 10 SHAPE
    S CAN BE ESTIMATED AT ONCE U
    SING DIFFERENT COLORS."
50 FOR I = 1 TO 1000: NEXT I: FOR
    I = 1 TO 22: PRINT : NEXT I
60 PRINT "THE GAME PADDLES ARE U
    SED TO MAKE ANY DESIGN."
70 PRINT : PRINT "GAME BUTTON #0
    CHANGES THE COLOR."
80 PRINT : PRINT "GAME BUTTON #1
    INDICATES THAT THE DESIGN
    IS FINISHED."
90 PRINT : PRINT "PRESS 'RETURN'
    TO PROCEED"
100 INPUT Z$
110 GR : COLOR= 15
120 FOR I = 0 TO 39: VLIN 0,39 AT
    I: NEXT I: REM SET SCREEN T
    O ALL WHITE
130 GOSUB 260
140 PRINT "HOW MANY DARTS DO YOU
    WANT THROWN?"
150 BL = 0:MA = 0:DB = 0:PU = 0:D
    G = 0:G1 = 0:MB = 0:LB = 0:B
    R = 0:O = 0: REM INITIALIZE
    COUNTERS TO ZERO
160 INPUT D
170 GOSUB 410: REM RANDOMLY GEN
    ERATE COORDINATE PAIRS,CHECK
    COLOR OF COORDINATE PAIR,AN
    D COUNT HITS

```

```

180 FOR I = 1 TO 10: PRINT : NEXT
    I: REM CLEAR TEXT WINDOW
190 PRINT "BLK MAG DEL PUR DGR G
    RE MBL LBL BRO GRA "; TAB( 2
    )(100 * BL) / D; TAB( 6)(100
    * MA) / D; TAB( 10)(100 * D
    B) / D; TAB( 14)(100 * PU) /
    D; TAB( 18)(100 * DG) / D; TAB(
    22)(100 * G1) / D; TAB( 26)(
    100 * MB) / D; TAB( 30)(100 *
    LB) / D; TAB( 34)(100 * BR) /
    D; TAB( 38)(100 * O) / D
200 PRINT "DO YOU WANT TO THROW
    MORE DARTS?"
210 INPUT A$
220 IF LEFT$(A$,1) = "Y" THEN
    GOTO 240
230 FOR I = 1 TO 10: PRINT : NEXT
    I: GOTO 110
240 GOTO 140
250 END
260 PRINT " MAKE A DESIGN...PRES
    S GAME BUTTON WHEN FINISHED.
    "
270 COLOR= 0: REM COLOR TO BLAC
    K
280 COLOR= C
290 A = PEEK ( - 16286): REM HA
    S PADDLE BUTTON #1 BEEN PUSH
    ED
300 B = PEEK ( - 16287): REM HA
    S PADDLE BUTTON #0 BEEN PUSH
    ED
310 X = PDL (6):Y = PDL (1)
320 PLOT X / 7,Y / 7
330 IF B > 127 THEN GOTO 360: REM

```

```

    NEW COLOR
340 IF A > 127 THEN GOTO 400: REM
    DESIGN COMPLETED
350 GOTO 280
360 C = C + 1: IF C > 9 THEN GOTO
    380: REM INCREMENT COLOR,IF
    ALL COLORS HAVE BEEN USED S
    TART OVER
370 GOTO 280
380 C = 0
390 GOTO 280
400 RETURN
410 FOR I = 1 TO D: REM FOR EAC
    H DART
420 E = RND (1) * 39:F = RND (1
    ) * 39
430 E = INT (E):F = INT (F)
440 T = SCRNI (E,F): REM WHAT IS
    THE COLOR?
450 IF T = 0 THEN BL = BL + 1
460 IF T = 1 THEN MA = MA + 1
470 IF T = 2 THEN DB = DB + 1
480 IF T = 3 THEN PU = PU + 1
490 IF T = 4 THEN DG = DG + 1
500 IF T = 5 THEN G1 = G1 + 1
510 IF T = 6 THEN MB = MB + 1
520 IF T = 7 THEN LB = LB + 1
530 IF T = 8 THEN BR = BR + 1
540 IF T = 9 THEN O = O + 1
550 COLOR= 0: REM PLOT DART HIT
    IN BLACK
560 PLOT E,F
570 COLOR= T: REM RESTORE ORIGI
    NAL COLOR TO DESIGN
580 PLOT E,F
590 NEXT I
600 RETURN

```


BOOK REVIEWS

Microcomputer Systems and Apple BASIC

by James L. Poirot
Sterling Swift Publishing Company

This book adds some new ideas to the standard BASIC language text. However, its occasional complexity and mathematical orientation may limit its appeal. On the plus side, James Poirot puts together some good ideas. As he says, "All too often a computer language is studied without first concentrating on 'problem solving' on the computer independent of the language. With literally hundreds of computer languages now in existence, one should first learn how to solve a problem on a computer and then how to use a specific language to implement that solution." Poirot achieves this goal by providing a comprehensive section on flowcharting before his chapter on programming in BASIC.

Poirot enriches his book further with

two brief, but fact-filled, introductory chapters: one on the history of computers; the other on the components of modern computer systems. Though these chapters are well organized and nicely illustrated, Poirot occasionally drifts into technical terms (e.g., *bit* and *loop*) without adequate explanation.

In addition, I feel that the flowcharting chapter gets too complicated too quickly; its exercises might confuse many students. Poirot does try to explain things in various ways, and to give examples of errors, but even so he quickly combines processes and rather rapidly jumps into ideas like *subscripted variables*. This chapter is the most difficult in the book.

Poirot slows down in the programming chapter and presents a clear, step-by-step introduction to BASIC. His section on debugging, an often overlooked topic, is one of his best. Unlike many BASIC manuals that come with

microcomputers, this chapter doesn't assume that the user will be sitting at a terminal. It could stand alone as an introduction to the BASIC language. Although Poirot does cover string variables, all of his final programming exercises are mathematically based. At their most complex, they involve such things as translating from binary to octal numbers or finding ratios in a Fibonacci series.

In my estimation, this book would be most useful for mathematically oriented older students. Its limitations are regrettable because the introductory chapters are well done and the interplay between flowcharting and programming is an important idea.

—Ricky Carter

Ricky Carter teaches computer literacy at Lesley College, Cambridge, Mass., and is a graduate student at MIT.

CALENDAR

February

Florida Instructional Computing Conference. February 4-5. Bayfront Course, St. Petersburg, Florida. Contact Sharon T. Lobello, The Florida Educational Computing Project, 109 Knott Building, Tallahassee, FL 32301; 904/488-0980.

Micro-Mini Computers, Personal Computers, and the Development and Evaluation of Educational Programs in Computer Science and Data Processing. February 12-13. Orlando, Florida. An AEDS Workshop. For a detailed brochure, contact AEDS Workshops, 1201 16th St., N.W., Washington, D.C. 20036; 202/833-4100.

National Association of Independent Schools Annual Conference. February 26-28. Sheraton-Boston Hotel, Boston, Massachusetts. Sessions will include "The Electronic Classroom" and "Microcomputers in the Classroom." Contact NAIS, 18 Tremont Street, Boston, MA 02108; 617/723-6900.

March

Microcomputers and Education. March 6-7. Jersey City State College, Jersey City, New Jersey. Speakers and workshops will focus on computer literacy as well as on using microcomputers in the classroom. Contact Microcomputer Conference, CATALYST, Jersey State College, 2039 Kennedy Blvd., Jersey City, NJ 07305; 201/547-3094.

24/CCN

Micro-Mini Computers, Personal Computers, and the Development and Evaluation of Educational Programs in Computer Science and Data Processing. March 12-13. St. Louis, Missouri. See February listing.

Authoring Courseware for Microcomputers. March 16-17. East Lansing, Michigan. Workshop sponsored by Association for Educational Data Systems. Emphasis on microcomputer programs and related documentation. Contact AEDS Workshops, 1201 16th St., N.W., Washington, D.C. 20036; 202/833-4100.

Planning and Support for Educational Computing. March. Scottsdale, Arizona. Will examine policy and procedure considerations in computing for educational decision makers at local, state, regional and national level. Contact AEDS Workshops, 1201 16th St., N.W., Washington, D.C. 20036; 202/833-4100.

April

Association for Educational Communications and Technology (AECT) Convention. April 6-10. Philadelphia Civic Center, Philadelphia, Pennsylvania. Over 300 sessions covering topics ranging from videodisc technology and microcomputers to updates on the copyright law. Contact AECT Convention Office, 1126 16th St., N.W., Washington, D.C. 20036; 202/833-4180.

Software

Cont. from page 9

software and Microphys's Allen Rosen are all trained educators.

Small vendors also say that they field test, though this can mean anything from actually testing a program in a classroom to letting the neighborhood kids try it out. These procedures will undoubtedly become more rigorous as standards go up and companies vie for survival.

According to Allen Rosen of Microphys Programs, the pressure on small vendors will become even more intense over the next five years as videodiscs are introduced and marketed with microcomputers by the larger firms. Mergers seem likely in the future, continues Rosen, as big publishers look for experienced educational programmers. More successful small producers may also enter into distribution contracts with major publishers — a model that's prevalent in the movie industry. And, of course, many smart and creative small firms will continue to operate as independent entrepreneurs, finding needs where they can and filling them.

Above all, we must keep in mind that the educational software industry — at least that part of the industry that is trying to provide programs for microcomputers — is but a few years old, not even yet at the awkward adolescent stage. But it is certain that a shake-out is coming and that the strong will survive. In the best tradition of American capitalism, we can hope for increased quality through competition.

Jeffrey Katz is a contributing editor for Classroom Computer News.

NEW PRODUCTS

Products briefs are written from manufacturers' announcements.

For the Disk that Needs Everything

Disks, Etc. carries a full line of products for storing, cleaning and mailing mini and standard diskettes. Products include: compact, lockable desk-top storage units that hold 80 to 100 disks; fan files, easel binders, vinyl holders and plastic library cases for storing diskettes; diskette head cleaners to remove dust, dirt and oxide from read/write heads; foam lined mailing envelopes to protect diskettes in transit.

The list goes on. For more information, contact Disks, Etc., PO Box 327, Center Valley, PA 18034; 215/439-1717.

Critical Reading

Critical Reading, a supplemental reading program, is now available from Borg-Warner Educational Systems. The program consists of eight diskettes emphasizing the skills of inference, paragraph meaning and general comprehension. Exercises vary from simple, two-sentence stories to longer, more complex paragraphs.

In addition to adapting in response to the individual requirements of each student, *Critical Reading* includes a management system that allows a teacher to view the progress of a single student or that of an entire class at any time.

Each *Critical Reading* diskette contains a pretest, teaching lessons, progress checks and a post-test and management system. The eight diskettes can be purchased at once or in sets of four. For more information contact MicroSystem80, Borg-Warner Educational Systems, 600 West University Drive, Arlington Heights, IL 60004; 800/323-7577; in Illinois, 800/942-6995.



Courtesy of The MicroPeripheral Corporation

MicroPeripheral's new direct connect modems eliminate the problems associated with acoustic coupled modems.

Direct Connect Modems

A new line of direct connect modems, designed to interface most popular computers and terminals to the telephone network, is now available from the MicroPeripheral Corporation. A direct connection to the telephone line eliminates the problems associated with acoustic coupled modems and provides high sensitivity, low error rates and noise free performance.

Called MICROCONNECTIONS, modems are avail-

able for the TRS-80, Apple, Atari and RS-232-based computers. Users can also attach a device, called the AUTODIAL/AUTOANSWER module, that permits automatic connection to other computers via the telephone network, with unattended data transfer, i.e., message sending and retrieval.

For additional information, contact The MicroPeripheral Corporation, 2643 151st Place N.E., Redmond, WA 98052; 206/881-7544.

No Experience Necessary

Teachers with little or no prior programming experience who want to use the microcomputer to administer their own multiple choice, true-false, fill in or matching tests, can do so with the new Computer-Based Individualized Testing System (C-BITS), available for Apple II and Bell & Howell microcomputers with 48K of memory and disk drives.

C-BITS features include: color graphics that can be presented with the test questions, random question selection, question grouping by concept, test editing capability, test item analysis

and student score recording.

C-BITS also provides several forms of student feedback. Audio and visual cues offer immediate feedback on whether answers are correct; the computer displays the student's test score; provides a display (or print out if printer is available) of missed questions and, if the student has scored over 80 percent, challenges him/her to a video game.

C-BITS programs come on two disks, accompanied by a user's guide. For more information, contact Educational Software Corporation, 414 Rosemere, Maquoketa, IA 52060; 319/652-2334.

Math CAI

MICROMATH is a full, one semester review mathematics course appropriate for students in grades eight to 12. Designed exclusively for the Commodore PET with 8K of memory, MICRO-MATH contains 93 lessons and 16 tests. Each lesson includes a pretest, the lesson, and some drill and practice on the lesson content. Some of the subjects covered: factors of integers, multiplication and division of fractions, manipulation of percents, basic algebraic operations, linear relations and their graphs, ratio and proportion.

For information, contact Mr. F. Winter, Sheridan College, 1430 Trafalgar Rd., Oakville, Ontario, Canada L6H 2L1; 416/845-9430.

Word Processing for Your PET

The Word Processing Program (WPP) available from Connecticut microComputer, Inc., in 8K and 16/32K versions, is now available for Commodore PET microcomputers.

The program permits composing and printing letters, manuscripts and other documents. It incorporates print directives including line length, line spacing, left margin, centering and skip. Edit commands allow the operator to insert lines, delete lines, move lines and paragraphs, change strings, save files onto cassettes, load files from cassette, move up, move down, print and type.

Added features for the 16/32K version include string search for editing, keyboard entry during printing for letter salutations, justification and multiple printing.

For further information, contact WPP, Connecticut microComputer, Inc., 34 Del Mar Drive, Brookfield, CT 06804; 203/775-4595.

Combating Computer Anxiety in the Administrative Office

by Kenneth Temkin

Technological innovation is nothing new for the administrative office. Electromechanical devices including telephones, typewriters and copying machines have all transformed the way in which office workers do their jobs. But as Don Avedon pointed out in a recent issue of *The Office* magazine, these machines "were introduced slowly over several decades, and their impact on office workers, while significant, did not have a dramatic emotional effect."

By contrast, desk top computers, word processors, reprographic and micrographic equipment, communications systems — a bounty of powerful machines — have swept into the office in less than a decade. They have indeed had an emotional impact. Reactions run from enthusiasm to apprehension, and administrators can't assume that their staff members will be among the enthusiastic. Misconceptions about the equipment's function, unfamiliarity with its use and fear of changes in the status quo (especially as concerns personnel and procedures) can all lead to an outbreak of computer anxiety. As one clerical worker who was recently introduced to data processing confided, "I'm scared because I don't know a thing about computers. Don't you have to have a super mathematical mind to use them?"

Through careful planning and staff education, supervisors can not only ward off computer anxiety, but also make the transition to a computerized office exciting for their staffs. The following suggestions might help.

Communicate, Communicate

Before purchasing the computer, the supervisor should meet with the staff to discuss short- and long-range plans for the office. Make staff feel comfortable by bringing them into the act. Ask them whether their jobs have become routine. Hit on problem areas, individual and organizational goals and budgets. Review job descriptions and office work flow. Always speak positively about the future, not

negatively about the present. Announce that the school administration is considering buying a desk top computer. Explain what a microcomputer is, how it differs from a big computer, what the cost/benefits are and why microcomputers are sweeping the country in businesses, schools and homes. Talk about the computer's versatility, from monthly reporting to editing letters. Stress that its purpose is to increase efficiency, eliminate duplication and speed up operations. Predict its impact not only on the department, but also on the overall organization.

*A flotilla of
powerful machines
has swept into the office
in less than a decade,
churning up
waves of anxiety.*

Encourage questions and suggestions.

During the computer selection process, invite vendors to demonstrate their equipment before the office personnel. Have your workers actually operate the computer under the salesperson's supervision. Staff opinions about the equipment, about the ease or difficulty of operation, are important and should help you make your final choice. If brought into the selection process, staff tend to accept rather than to reject the new addition to the office.

Arrange time for the office employees to visit and talk with employees of other municipal departments and school systems who are already using microcomputers. Hearing good reports from co-workers will help reduce fears. Also, route magazine and newspaper articles, books, manuals and brochures around the office to familiarize people with the state-of-the-art.

Keep the office posted on how the acquisition is progressing and on the

expected delivery date. In the meantime, send the future users (minimum of two at a time) to the dealer for classroom training. This learning experience will prepare them to use the computer while giving them the confidence they need.

The supervisor should also know as much as possible in advance about the computer's hardware, software, start-up, operation, capabilities and limits. To be the promoter of this office technology and not know how to use it might prove embarrassing. The staff could lose its confidence and excitement.

Hands On

Be ready to use the computer shortly after it arrives at the office. Don't give your staff time to gawk. Have a simple off-the-shelf program available. A simple accounting program might be a good choice. Choose a respected person who enjoys a challenge to begin using the computer. When the operator has completed the job, let her go over the process for others who will eventually use the computer.

After the microcomputer has been around for a while and operations are going smoothly, try to keep the momentum going. Revise job descriptions to include data processing. Offer tuition reimbursement for courses at community schools to help employees enrich their knowledge of data processing. Keep your eyes open for seminars and lectures (not too technical) that they might attend. Display the new office technology through demonstrations for other departments.

Through the supervisor's patience, understanding and compliments, staff members will realize the value of the equipment to themselves as well as to the school administration.

Kenneth Temkin is the administrative assistant for support services for the Newton Public Schools, Newton, Mass. He is actively writing administrative software.

Source and Resource

by Katharine G. Cipolla

At one time, computer people could find all the professional information they needed in computer journals, and educators could turn solely to education journals for their professional illumination. But not anymore. Computers have invaded the classroom and education has become a concern of the computer industry. Each group's work is important to the other. But computer people still publish in computer journals, even when they write about education, and teachers still stick to education journals, even when their subject is computers — communication between the two groups is as difficult as ever.

Both teachers and computer researchers interested in educational computing can use existing library tools to find out about relevant publications in one another's journals. A quick, and very unscientific, study of publishing patterns in the educational computing field showed that a few very relevant journals like *IEEE Transactions on Consumer Electronics*, *Journal of Computer-based Instruction* and *Computers and Education* each publish more than 15 relevant articles per year. About another dozen journals, divided equally between computer and education titles, offer 10 to 15. But these altogether contain only a fraction of the total relevant information in print. Most articles are either in specialized journals like *Computer Communication*, *International Journal of Man-Machine Studies* and *Physics Teacher*, or in the proceedings of conferences. You won't find these by serendipity. You have to look in the right places.

Educational Indexes

Teachers and educational researchers know all about ERIC, the Educational Resources Information Center. ERIC publishes two indexes: *RIE: Resources in Education* lists reports and unpublished papers available from the ERIC Clearinghouse; *CIJE: Current Index to Journals in Education* indexes the international journal literature of education.

The Main Entry Section of *RIE* or *CIJE* lists articles only by very broad

subject disciplines, such as "Teacher Education" or "Tests, Measurement & Evaluation." The Subject Index, however, brings special topics into focus. Articles on "Applications of Computers to Education" are found under perhaps too many subject headings: 19 specific topics begin with the word computer, along with microcomputers, microprocessors, simulation, programmed instruction and educational technology. Under such headings, you will find the title of the article, the citation information and a number referring to the location of the abstract within the Main Entry Section of the ERIC publication. Both ERIC titles are published monthly with semiannual cumulations to make searching more efficient.

Such vast quantities of data can only be indexed using computer techniques. A by-product of this technology is machine-readable tape of the indexes, which makes an on-line computer search possible. The ERIC database is available for on-line searching at most university libraries and some large public libraries. Costs and restrictions vary with the institution, but the time saved is usually well-worth the cost.

Computer Indexes

ERIC, whatever its virtues for locating education publications, does not pick up relevant material published in computer journals. To find out what the computer world is saying about computers in education, you have to dig into the computer literature. *Computer and Control Abstracts* is one of the two most efficient sources. The monthly issues are organized by broad subject area. They contain a special section on "Computer-Aided Instruction," as well as sections on "Applications of Systems Theory to Education," "Simulation and Modelling" and "Personal Computing." While these areas are admittedly general, the semiannual indexes give very fine subject access to articles. Items on "Application of Computers to Education" may be listed under any of five subjects beginning with education, educational, teaching or computer-aided instruction. Under these subjects, you will

find a short key-word phrase, resembling a title, and the reference number to the location of the abstract in the monthly abstract journal. When you look up the abstract, you will find the full title, the author's name, citation information and the abstract itself. *Computer and Control Abstracts* covers not only journal material, but also conferences, books, reports and patents. The semiannual indexes and the monthly abstract journals list these special materials. Like ERIC, *Computer and Control Abstracts* is available in machine-readable form.

Another source is the Association for Computing Machinery's *Guide to Computing Literature*. This annual index begins with a list of citations, each with an assigned identification number. A keyword index, with article titles and identification numbers listed under each appropriate keyword, follows.

A broader classification scheme refers to *Computing Reviews*, the ACM journal for which the *Guide to Computing Literature* serves as an index. This scheme is useful because of its "Education" category. Citations include not only material listed in the *Guide*, but also signed reviews published in *Computing Reviews*. These reviews are sometimes short abstracts, but more often are long (5,000-6,000) critical reviews of books, articles or conference proceedings.

Still other library tools are worth knowing about for specialized information. Chemistry teachers may find specific articles related to the use of computers in the chemistry lab or classroom in *Chemical Abstracts*; biology teachers will need *Biological Abstracts*, psychology teachers *Psychological Abstracts* and so forth. To the extent that knowledge gained in using computers to teach one discipline can be translated to another, we all should know about these. However, for the majority of relevant publications, the indexes to the education and computer literature should suffice.

Katharine Gardner Cipolla is the media services librarian at Barker Library, MIT, Cambridge, Mass.

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LETTERS

Info, Please

On page 25 of CCN Vol. 1, No. 1, some periodicals and projects were mentioned. Could I have the addresses of the following: *The Computing Teacher*, *Purser's Magazine*, *Creative Computing*, *Recreational Computing*, *Project LOCAL*, *MECC*, *AEDS*, *ICCE*.

Pat Hardy
Deer Park, California

We're glad you asked:

The Computing Teacher
c/o David Moursund
Department of Computer and
Information Science
University of Oregon
Eugene, OR 97403

Purser's Magazine
c/o Robert Purser
PO Box 466
Eldorado, CA 95623

Creative Computing
PO Box 789-M
Morristown, NJ 07960

Recreational Computing
PO Box E
Menlo Park, CA 94025

Project LOCAL
200 Nahatan Street
Westwood High School
Westwood, MA 02090

MECC
2520 Broadway Drive
St. Paul, MN 55113

AEDS
1201 16th St. NW
Washington, DC 20036

ICCE
See *The Computing Teacher*

Wonder Bread, Move Over

I have just seen a sample copy of your newsletter. I think it's the greatest thing since sliced bread. Thanks.

Thomas Russo
Bayonne, New Jersey

More Silly Bull

There was a young bull of
South Trisket
Thought of ending up shoulder
or brisket
"Well this I don't need,
I'll just learn how to read,
Come long words and longer,
I'll risk it."

Jay Katz
Boston, Massachusetts

...and More

I just read *Classroom Computer News* with delight. But a question about *Silly Bull* (by Jeff Nilson, *Classroom Compu-*

ter News, Volume 1, No. 2). Are the errors I get when I run the program bugs in the program? I'm a beginner and haven't worked out a solution myself yet.

Tom Small
Haverford, Pennsylvania

Jeff Nilson's reply:

A few readers have had trouble getting *Silly Bull* to run. At the point where the program is supposed to select the words for the game, it chooses a few words and then gets caught in a loop. The game stops before it has begun.

In each *Data* statement in lines 10000-10030 are 13 numbers, each separated by commas. For *Silly Bull* to run correctly, there should be only numbers and no blank spaces in the series. Each number should be separated by a comma.

Applesoft lists the *DATA* statements as though there were 12 extra spaces between the '2' and '0' in lines 10000 and 10010. The same 12 spaces seem to appear between the comma after the eighth number and the third zero in lines 10020 and 10030. If you make your *DATA* look like the Applesoft listing, *Silly Bull* won't run. Or if you add any extra commas or numbers to the *DATA* statements, *Silly Bull* won't run.

Putting blanks, commas or extra numbers in lines 10020 or 10030 will produce this result. The 0 is the flag that tells the computer if a syllable has been printed in one of the grid spaces. A '0' with 12 extra spaces will make the computer think a syllable is in one of the empty grid positions when it is not. This mistake occurs at line 2600:

```
IF SL$(RP,3) 0 THEN 2590.
```

At 2590 the computer looks for another number for a space that might be empty, i.e. having a '0' in it. Finding no '0', line 2600 tells the program to go to line 2590 again. *Silly Bull* gets looped and doesn't work.

Collector's Items

We have received many requests for back copies of our premier issue (September/October, 1980). Sorry to say, *Classroom Computer News*, Volume 1, Number 1, is already a collector's item. Our small press run hadn't anticipated the overwhelming response CCN has received. We're all sold out. Copies of the November/December 1980 issue, Volume 1, Number 2, are still available from *Classroom Computer News*, PO Box 266, Cambridge, MA 02138.

ZX80

Cont. from page 18

roots and another for division, both of which yield decimal answers, but these are hard ways around the problem. As a result of this limitation to integers, don't plan to use the Sinclair for heavy number crunching; you cannot even use it to balance your check book if you ever expect a balance of over \$320.00. Differences in the BASIC language also mean that translating programs that run on other computers for use on the Sinclair will require special care.

Extra Memory

Sinclair is responding to these problems. The company is coming out with two new memory units. One is a BASIC chip that replaces the present one. This will include the missing commands and provide floating point arithmetic, which means 13 divided by 4 will equal 3.25 instead of just 3 as it does with integer arithmetic. It will also include a series of graphics commands that will give it crude graph plotting capability and the ability to do animated displays. The other added memory is a unit that will plug into the back of the ZX80 to give it 16K of effective, accessible memory (RAM). It all begins to add up. We estimate the cost would be about \$500 to get the ZX80, a TV, a cassette recorder, and the new BASIC chip and expanded memory unit. That still could be cost effective for schools, depending upon the uses anticipated.

An exciting low-cost educational use that takes advantage of the Sinclair's easy portability would be to let students take the computers home as they are learning BASIC. While the school may not have a lot of spare TVs, there is one in almost every home, so only the \$200 computer itself would have to be purchased. This would give students the chance for a lot of "hands on" programming practice at home and could be the breakthrough to real computer literacy. Too often, a handful of computer enthusiasts, typically boys, take over the limited number of terminals or micros available in a school, and the majority of students do not get enough experience to feel comfortable with programming or the computer. The Sinclair ZX80 is uniquely well suited to make this possible.

The ZX80 is not currently available in stores in the U.S.; it is available only through mail from Sinclair Research Ltd., 475 Main St., P.O. Box 3027, Wallingford, CT 06492.

Dr. Robert F. Tinker and Tim Barclay, both on the staff of Technical Education Resource Centers (TERC), Cambridge, Mass., are, respectively, director of the Technology Center and staff associate in the Computer Resource Center.

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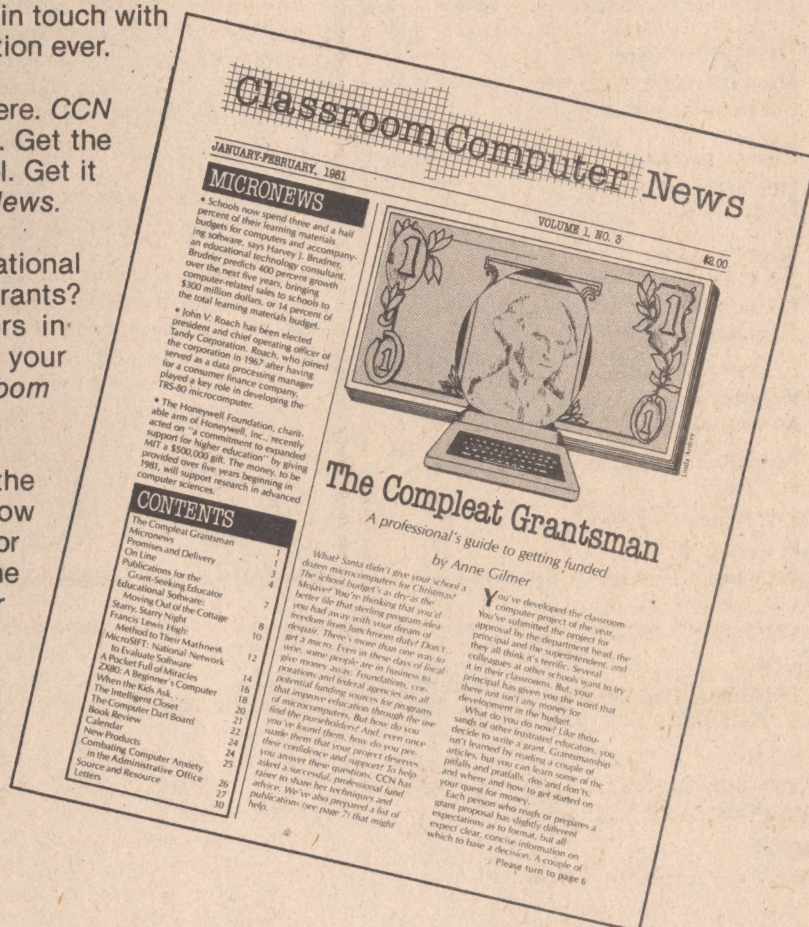
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In terms of style, we are interested in news and feature stories that are fact filled, well-written and expressly directed toward our bright and critical readers. Stories should be lively, concrete and written for intelligent humans, with minimal use of computer or educational jargon.

News stories, as presented in the On Line section, run 300 to 400 words. Feature stories run from 800 to 2500 words. Clear, high-contrast glossy 8 x 10 photos are welcomed. Computer programs must be well-documented, thoroughly tested and machine printed. Use a new ribbon and clean white paper for program listings. Manuscripts should be typed and triple-spaced.

Classroom Computer News will pay \$20 to \$50 a printed page upon publication for reader-contributed stories, depending upon the quality of the manuscript and the amount of editing/rewriting needed. Contributors will also be given five copies of the issue containing their submission.

Send queries or manuscripts to Lloyd R. Prentice, Editor, *Classroom Computer News*, Box 266, Cambridge, MA 02138. Allow six weeks for acknowledgement. All submissions will be acknowledged, but only manuscripts accompanied by a self-addressed stamped envelope will be returned if not purchased.

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